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The Bancroft Oration.[1]

THE SPIRIT OF THE RESEARCHER.

By E. H. DERRICK, M.D., F.R.A.C.P.,
Deputy Director, the Queensland Institute of Medical Research, Brisbane.

IT is my privilege tonight to voice our tribute to the life and qualities of Joseph Bancroft. In 1876 he discovered the adult form of the worm which bears his name in a lymphatic abscess of the arm, and again later in a hydrocele. He thereby placed Queensland on the research map of the world. He well deserves our remembrance for his contributions to medical science and for the honour that he brought to Queensland.

The phenomenon to which I invite your attention is not, however, the presence of *Wuchereria bancrofti* in brachial abscess or hydrocele. That fact, important in its day, has long since been absorbed into the general body of knowledge. Rather would I consider the underlying phenomenon which Bancroft's discovery exemplifies—the process by which new knowledge is brought to birth. This phenomenon is worthy of study, for it can be highly advantageous to humanity—if the new knowledge is used aright.

How came Bancroft and his forerunners and successors to contribute to knowledge? What qualities did they possess that made them successful investigators? These are the questions that I would seek to answer tonight.

Let us survey the lives of some notable investigators and see if any qualities are common to them all or recur with significant frequency. I should explain that, in selecting the examples that follow, I have made no systematic attempt to include all research types or to pick the greatest. They have been chosen quite arbitrarily from among those who have crossed the horizon of my reading, and who have thereby commanded my respect and gained my affection.

There have been some unusual prescriptions for success in research. Mathias Schleiden (1804-1881) was made so miserable by his failure in the practice of law that he shot himself in the head. He then took up the microscopic study of plants, and became one of the great names in botanical research.[(1)] If examiners in law schools cared to adopt this method of dealing with their failures, there might be some further startling developments in science.

The Classical Research Type—Sherlock Holmes.

Nowhere do we find the classical concept of the research worker so well exemplified as in the friend of our boyhood—Sherlock Holmes. His historicity may be dubious, but his medical ancestry, by Conan Doyle out of Joseph Bell, is unimpeachable.

His qualifications as researcher were profound. He had insatiable curiosity, acute perception, a never-failing memory, and a specialized training, particularly in chemistry, toxicology and anatomy. "He manipulated his fragile philosophical instruments with an extraordinary delicacy of touch." He possessed a passion for definite and exact knowledge, and an imagination able to weave a theory or piece together a broken chain of evidence.

Such was his scientific objectiveness that it was even imagined that he might administer to a friend a pinch of the latest vegetable alkaloid, not out of malevolence, but simply out of a spirit of inquiry, to ascertain the exact effect.

Nor did he spare himself. When Dr. Watson first met him, his hands were mottled with pieces of plaster covering the punctures made by a bodkin to provide blood samples for his tests.

As to his research achievements, did he not devise the Sherlock Holmes test for hæmoglobin, sensitive to one part in a million? Was he not the author of the classical monograph on the 140 varieties of tobacco ash? Did he

[1] Delivered at a meeting of the Queensland Branch of the British Medical Association on June 4, 1948.

not contribute to the literature on tattoo marks? And was not the basic research of his earlier years the foundation of his success in his chosen profession?

True, he was regarded by the undiscerning as eccentric. He had amassed an immense store of out-of-the-way knowledge, but was lamentably ignorant of politics, of philosophy, of general literature. His methods of work were erratic and so were his moods. Nothing could exceed his energy when the working fit was on him. Then for days on end he would lie on the sofa, hardly uttering a word, and with a dreamy vacant expression on his face.

There is one type of investigator.

Pertinacity—Christopher Columbus.

I turn next to another of a very different type.

It was the fate of Columbus (*circa* 1447-1506) to experience almost every vicissitude that a researcher could, and experience them all in the most extreme degree. His story would seem to belong to melodrama rather than to actuality.

The idea that captured him in his youth was a magnificent one. By the age of twenty-seven years he had definitely determined to reach India by sailing westward. No doubt he was influenced by the fantastic tales and speculations that were current in his day about the unexplored parts of the world, but underlying the choice of his life aim was some genuine reasoning: the sun goes round the earth in twenty-four hours; travellers had already journeyed a distance to the east corresponding to fifteen hours; therefore if one started westward there would be only about a third of the earth's surface to traverse before reaching the point already known from the east. It was not the fault of Columbus that the figures were inaccurate—there were no chronometers then for the exact measurement of longitude. And many a researcher since has embarked on a project imbued with just such a mixture of truth and error, reason and speculation.

But while Columbus knew the heights of inspiration, he had also to plumb the depths of ridicule, of treachery and frustration. His idea burned within him for eighteen long years, while the best of his life slipped away, before he gained the opportunity to test his idea experimentally. There was no one in his birthplace, Genoa, who could finance the expedition, so he went to Portugal, where there was an active spirit of exploration. But after ten years he had failed to convince King John II of the importance of his idea. Henry VII of England was not interested. For seven years he importuned the Spanish Court, and, sick at heart, was in the act of leaving for France when Queen Isabella decided to back the venture. She did this in opposition to the advice of her council. She sensed the genuineness of Columbus and was prepared to sell her jewels to back him. Three small ships were provided. He still had to find his crew. It was difficult to inspire others with his faith; some worthy disciples he found, but to complete his crew he had to scour the gaols.

We know how after a voyage of seventy days he arrived, not in India, but in the West Indies. Curiously he never knew he had found America; to the end of his life he looked on the West Indies as part of China. Like many an investigator, he failed to find what he sought, but in the search he stumbled on something greater. Grandiose as were his dreams, they were surpassed by his achievement. He did more than make a discovery. As only the very greatest have done, he opened a whole new world for later investigators to explore.

Never was outlay on research so richly rewarded; in return for Queen Isabella's investment of three ships, Spain gained an empire, which gave her wealth untold and for a time the mastery of Europe.

The world has since acclaimed the greatness of Columbus, but the country he benefited rewarded him grudgingly and ungratefully. In the rush to grasp the wealth to which he had opened the way, the discoverer was thrust aside. He was removed from his governorship and sent home in chains. He died neglected and forgotten. And the continent which should commemorate him was named after a nobody—a merchant's assistant—because he wrote an interesting account of a later voyage.

Among the various great qualities of Columbus, the one that stands out is pertinacity. Through frustration, ridicule, treachery, mutiny, perils of the sea, he remained steadfast to the heavenly vision and battled on until every difficulty and hazard were overcome and success was attained.

Joaquin Miller has well expressed this quality:

> Behind him lay the gray Azores,
> Behind the Gates of Hercules;
> Before him not the ghost of shores;
> Before him only shoreless seas.
>
> . . . . . .
>
> "What shall I say, brave Adm'r'l, say,
> If we sight naught but seas at dawn?"
> "Why, you shall say at break of day:
> 'Sail on!' " . . .
>
> They sailed and sailed, as winds might blow,
> Until at last the blanched mate said:
> "These very winds forget their way,
>
> . . . . . .
>
> For God from these dread seas is gone."
> He said: "Sail on!" . . .
>
> They sailed. They sailed. Then spake the mate:
> "This mad sea shows his teeth tonight.
>
> . . . . . .
>
> What shall we do when hope is gone?"
> The words leapt like a leaping sword:
> "Sail on!" . . .

And sail on he did until he reached his journey's end.

Writing for Philosophers.

As an example of the patient, careful type of investigator, let me take Clifford Dobell, who has devoted forty years to the study of the protozoa inhabiting the intestinal tract. His work suggests that protozoology is a study to be undertaken only by the patient mind; let the intuitive mind seek other fields!

His work entailed countless examinations for amœbæ. He prepared innumerable smears, stained them by many techniques, cultured many strains in a variety of media, and finally took the trouble to record his observations in numerous accurate drawings.

In a case of amœbic infection, amœbæ may be scanty in the intestinal contents and difficult to find. A common rule in clinical diagnosis is that there should be six examinations which should produce negative results on successive days before amœbiasis is excluded. Dobell,[2] in his research work, set much more rigorous standards:

> . . . more than 45 consecutive negative examinations, made with every microscopical care and cultural control, may be needed to prove that a monkey is really uninfected with *E. coli*. In my own work I have never accepted less evidence as proof of noninfection.

After examining himself microscopically 256 times and culturally 60 times without finding *Entamœba coli*, he committed himself so far as to say that it was "highly probably" that he was not naturally infected with this amœba.

With regard to the labour involved in culturing *Entamœba coli*, let me quote Dobell again:

> The requirements of this species are exacting, and the continuous propagation of any strain *in vitro* demands ceaseless vigilance. *E. coli* is very sensitive to even slight changes of temperature . . . hydrogen-ion concentration . . . and other environmental factors; so that the continuous maintenance of even a single strain involves continual anxiety. It means frequent examination and transplantation of cultures, with strict attention to asepsis and control of all culture-media, and constant supervision of incubators during the entire period of cultivation.

Dobell found that the adequate illustration of every phase of the life history of one species of amœba might require as many as a hundred drawings. These drawings were carefully made from actual specimens with the aid of the *camera lucida*. He avoided the easy snare of making them diagrammatic.

As a result of his life work Dobell has left on record detailed, illustrated studies on the morphology and life

history of intestinal protozoa that will be a reliable source of reference for several generations. All who have occasion to need accurate information on this subject are grateful to him.

Protozoology is a field that has been badly confused by the hasty publication of inaccurate observations and ill-founded speculations. We have no difficulty in agreeing with Dobell that his "more pedestrian procedure—demanding adequate control at every step—is scientifically sounder, and therefore more likely to yield results of permanent value". He quotes with approval the reply of Leeuwenhoek, the first and greatest of protozoologists, to impatient critics: "I don't write for such folks, but only for Philosophers."

The Classification of Researchers.

Before going on to describe other researchers, I would here interpolate some comments on their classification.

We have it on the authority of Robert Browning that there are two contrasting types:

> That low man seeks a little thing to do,
> Sees it and does it;
> This high man, with a great thing to pursue,
> Dies ere he knows it.
> That low man goes on adding one to one,
> His hundred's soon hit:
> This high man, aiming at a million,
> Misses an unit.

When he died the high man was appropriately honoured by being laid to rest on the topmost peak.

> Here—here's his place, where meteors shoot, clouds form,
> Lightnings are loosened,
> Stars come and go!

In a prosaic echo of Browning, W. D. Bancroft,[3] a professor of chemistry at Cornell University, and, I am informed, no relation of Joseph Bancroft, has proposed to classify scientists in two groups—guessers and accumulators. The guessers are men who work mainly with theories and hypotheses; the accumulators are mainly collectors of facts. Guessers reveal new directions for future research; accumulators fill the gaps left by the more enterprising and bolder spirits.

This classification is useful in focusing a discussion, but it is obviously superficial and inadequate. Researchers are not so easily pigeonholed. Guessing and accumulating hardly cover all research activities, nor does the one exclude the other. Columbus was not merely a guesser, but devoted his life to testing his guess. Browning's grammarian, while hazarding all on his faith, was also a tireless worker; even as he lay dying he struggled on with his etymological research. High honours are due to those who, like Darwin, have patiently and industriously collected accurate data and on that reliable foundation have developed an illuminating hypothesis.

Kenneth Mees[4] has improved and extended the classification. He considers there are three types of mind—those capable of theoretical synthesis, those capable of observation and experiment, and those capable of invention. It is rare for one man to excel in more than one direction. He names Descartes as an outstanding example of the pure theorist and Edison of the pure inventor. Galileo and Kelvin were exceptional types who excelled in all three.

While there are obvious differences of ability among researchers, one should hesitate to pronounce on the relative merits of the different types of mind. Inspirations, reasonings, observations, experiments, inventions—all are needed for progress. Let each researcher contribute to the sum of knowledge according to his predilections and opportunities. *Pace* Browning and W. D. Bancroft, the accumulation of new facts is a very necessary procedure, particularly in a young country like Australia.

Enlightened Opportunism—Joseph Bancroft.

Of Mees's three groups, Joseph Bancroft (1836-1894) belonged essentially to the second. He had no flair for theoretical synthesis, though he gets honourable mention for inventiveness—as witness the making of his own surgical instruments and a chloroform inhaler, which caused no mortality, although it appeared to Sandford Jackson[5] to contravene almost every rule of current anæsthetic practice.

Observation and experiment were his *forte*. Coming as a young man to a new country, he found new plants, new animals, new diseases. In all these he took a keen interest. Every plant was a potential drug. He extracted essential oils and gums and made tinctures and experimented with them in the treatment of disease.[6]

A traveller from Cooper's Creek brought him some pituri (*Duboisia hopwoodii*) leaves, which were used by the aborigines to poison waterholes to stupefy emus and marsupials. Bancroft[7] prepared an infusion and found that, on subcutaneous injection into a cat, a puppy and rats, it produced death rapidly as in tetanus from excessive contraction of the respiratory muscles and consequent suffocation. He thought that it might be a "tonic nervine", and tried it in some patients suffering from extreme debility, but the dose was too cautious to allow an opinion of its value.

On a hint from von Mueller, Bancroft next turned his attention to the allied species, *Duboisia myoporoides*. Disregarding von Mueller's suggestion to try it first on a blackfellow, Bancroft tested it on dogs and cats and found it to possess an action like "atropia". When he found local application to the eye rapidly evoked mydriasis, he used it regularly in his ophthalmic cases. He tried it internally in asthma, but advised caution after an asthmatic under its influence became confused in the night and attacked all the other inmates of the household with a stick.

Bancroft's discovery of the "atropia"-like action of *Duboisia myoporoides* may have been of more consequence than the discovery of the worm that brought him fame, for hyoscine and hyoscyamine are now being extracted from this plant on a large scale, and Australia has become the chief country of supply of these drugs. This has developed from Bancroft's pioneer work in pharmacology.

I do not propose to follow in detail Bancroft's diversified scientific interests; these examples serve to indicate his spirit. His mind played searchingly on the phenomena that lay around him, and he seized on what was significant, always with a bias toward the practical. He displayed what might be described as an enlightened opportunism. One is reminded of Robert Koch, who modestly explained his success by saying that in his wanderings through the medical field he came upon regions where gold was still lying by the wayside. This was of course an under-statement. Apart from the fact that others walked through the same regions without perceiving it, what gold Koch and Bancroft saw exposed led to the finding by experiment of much more gold that lay hidden.

Perhaps the most extraordinary example of this talent for producing gold from the immediate environment is that of the Negro scientist, George Washington Carver.[8] From the peanut he produced over 300 products, including milk substitute, cheese, plastic, breakfast food, vinegar, insulating boards, paper, dyes, soft drinks, axle grease and printer's ink. His work turned what had been regarded as little better than pig feed into an industry worth 60 million dollars a year to the United States.

The Mantle of Joseph Bancroft.

Among those on whom the mantle of Joseph Bancroft has fallen—those who have been alive to the special possibilities that this new country offers for prospecting—I would instance J. B. Cleland. He has seized every opportunity as it came to contribute to knowledge. Anyone who studies the history of investigations into diseases in Australia will be surprised to find how often the foundations were laid by him. Leptospirosis became topical in Queensland in 1933; fifteen years earlier Cleland had reported examinations of rats for leptospirosis and other diseases. I do not think that any native animal came within reach of him or his co-worker, Harvey Johnston, without being examined for parasites. He has systematically recorded cases of injury and disease due to Australian fauna and flora.

A question that interests epidemiologists is why an epidemic of dengue sweeps down the coast of Queensland into northern New South Wales every decade or so. The answer is clear—to supply researchers with material for investigation. The 1905 epidemic was used by T. L. Bancroft for some valuable, but not quite conclusive, transmission experiments with the mosquito, *Aëdes ægypti*, then called *Stegomyia fasciata*. When the next epidemic invaded Queensland in 1916, Cleland, then in Sydney, prepared his campaign and assembled his mosquito traps. When it crossed the border into his State of New South Wales, he advanced to meet it. The first round was fought at Murwillumbah. Cleland collected his mosquitoes, but honours were easy: the dengue got Cleland. As the epidemic reached Mullumbimby his assistant took up the fight. With the material they obtained and the help of human volunteers, the transmission of dengue by *Aëdes ægypti* was triumphantly proved.

In the following year there was an alarming outbreak of disease in the Darling Valley. Cleland was again on the spot and showed that it was acute encephalitis. His comprehensive account of that outbreak, together with Breinl's record of the disease in Townsville, form the starting point for any subsequent study of Australian "X" encephalitis.

In the great days of Bright, Addison and Hodgkin it was rumoured that disease was made for Guy's Hospital. But that was before the days of these Australian epidemics.

Serendipity and the Prepared Mind.

It has to be admitted that chance has played an important part in many discoveries. Indeed a special name —serendipity—has been proposed by Horace Walpole for the faculty of making happy and unexpected discoveries by accident. "Serendip" is an ancient name for Ceylon, and in a fairy tale, three princes of "Serendip" were always making discoveries, by accidents and sagacity, of things they were not in quest of.[9]

Serendipity has been a frequent contributor to science. The supreme example was the finding of America by Columbus when he sought India.

A firm of manufacturing chemists (Scottish Dyes, Limited) found that many of their batches of phthalimide were unsaleable owing to the presence in them of a blue stain.[9] The phthalimide was prepared from phthalic anhydride and ammonia by fusion in a porcelain-lined vessel. The origin of the blue stain was eventually traced to a pinhole in the enamel of the vessel, which allowed the melt to come in contact with iron. Further investigation showed it to be a phthalocyanine related in constitution to the hæmin of blood. Monastral fast blue BS, as it was named, proved to be a perfect blue dye with only a very slight tinge of green and was far superior to all other colours in fastness to light, to acids and to alkalis. Its discovery, by accident, was acclaimed as the greatest chemical achievement of 1936.

More recently Shaw Dunn and his colleagues[10] set out to discover why a man with a crush injury of a limb might die some days later of renal failure. Their working suggestion was that certain chemical substances might be formed in crushed muscle which, carried in the bloodstream to the kidneys, damaged them. They listed likely substances and injected them one by one intravenously into rabbits. After testing a number they found one called alloxan which did damage rabbit kidneys; but unfortunately for their experiments rabbits injected with alloxan died for some other reason. They followed up this bypath and found the reason to be destruction of the island tissue of the pancreas. Although disappointed in their primary aim, these workers realized that they had been presented with a most valuable discovery. The study of diabetes had been greatly hampered by the absence of a method of producing diabetes in an experimental animal. And now exactly what was needed had been found accidentally.

While the primary honours of monastral fast blue and experimental diabetes go to serendipity, honours are also due to Scottish Dyes, Limited, and to Professor Dunn's team because they seized their opportunities. Without the alert mind and the scientific temper, the discoloration of the phthalimide and the failure of the kidney experiment might simply have evaporated in futile repining. No doubt many glorious opportunities have been missed because the observer saw but did not perceive.

"The seeds of great discoveries are constantly floating around us", said Joseph Henry, "but they only take root in minds well prepared to receive them." Which is an earlier paraphrase of Pasteur's famous "chance favours the prepared mind".

What an asset to the researcher is the prepared mind—a mind well stored with the knowledge of what has already been discovered, that knows the boundary that "divides the desert from the sown", that is alert to the significance of any intruding fact, especially one that disturbs the current theory. And what a masterly combination when serendipity favours the prepared mind!

The Comfortable Chair of Hughlings Jackson.

We pass next to Hughlings Jackson[11] (1835-1911), whose field of research was clinical neurology. He never performed an experiment, but he saw in every patient an opportunity to learn something more of normal and morbid functions. Disease was the great experimenter, and Jackson observed faithfully the sequence of cause and effect.

The nervous system is particularly well adapted for analysis. It manifests its disorders in a hundred ways—by pains and anæsthesias, by spasms and paralyses, by activities and comas, by moods, attitudes, behaviours. Every part of the system proclaims its troubles in its own precise way. In all these manifestations Jackson revelled. He observed, he recorded, he correlated with post-mortem findings, he pondered, he learned the significance of symptoms, he sought to fit every casual fact into its place in the general body of neurology.

Like so many researchers he began by exploiting a new technique. Quick to realize the value of the ophthalmoscope, he used it very extensively and by its aid obtained much help toward a clearer knowledge of diseases. It demonstrated, for example, how widespread were the tissue changes in some cases of advanced granular disease of the kidney. In cerebral disease Jackson insisted on its use as a matter of routine, and explained that the physician who used it was not merely seeking a new symptom, but was observing changes in a nervous organ. The optic neuritis he might find was but a visible fragment of a much wider change.

The study of epileptic convulsions occupied much of his attention for some years. In particular he described the local epilepsy that is now called after his name, and showed that it was caused by a lesion in the middle cerebral area. He noticed that defects of speech might follow disease of the left side of the brain. Following these strong leads, he developed those fruitful researches into cerebral localization which gave, in the words of Paget, "lucidity to physiology and guidance to surgery". His industry and the fertility of his genius are indicated by the publication of over two hundred papers during the thirty-five years of his active association with the London Hospital. The total later reached three hundred.

Jackson was, of course, not unique in making and correlating clinical and pathological observations. The method is at least as old as Boerhaave (1668-1738) and Morgagni (1682-1771). And particularly in the half-century before Jackson's work, there had been a great outflowering of it, associated with such names as Laennec (1781-1826), and the Guy's Hospital physicians already mentioned, to quote but a few. Jackson's work followed on theirs. Because of the complexity of the nervous system, its secrets could be unlocked only after a more general knowledge of the dysfunctions due to disease had been attained.

Hughlings Jackson concerns us tonight because he was one who was not content simply to accumulate facts, but who meditated over them until he had systematized them and deduced from them general principles. His powers of deduction were outstanding and his conclusions often anticipated experimental verification by many years.

Farquhar Buzzard allows us a revealing glimpse of the master's practice (for the advice which follows undoubtedly flowed from his own experience):

> Hughlings Jackson used to urge upon his students the value of sitting down in a comfortable chair at the end of a day's work, allowing their thoughts to wander around something which had aroused their interest during the day, and jotting down the ideas and suggestions to which it gave rise. It was a valuable habit; it encouraged independent criticism; and it prevented observations from being left isolated, giving them apt associations, and stimulating the student to turn up and explore the byways of thought.

"Arm chair" methods have been decried and with some justification. Nevertheless, they have an indispensable place in research—when the meditations are soundly based on observations of fact. Indeed, medicine owes much to that "comfortable chair" of Jackson. I hope that it is preserved somewhere, for in it were conceived and brought to birth principles on which the science of clinical neurology was established.

Beyond the Laboratory—Thomas Huxley.

Some research workers like Harvey and Darwin, having given birth to their brain-children and launched them in the ocean of scientific literature, have been content to let them sink or swim on their merits. Others have felt that truth needs much more active vindication. Of these was Thomas Huxley[12] (1825-1895). As a researcher, he "worked over almost the whole face of zoology" and did much to systematize it; but his powerful mind and restless temperament could not be satisfied in scientific seclusion. He sallied forth from the laboratory, and early acquired a reputation for militancy. This was expressed, *inter alia*, in the meditation that he recorded in his notebook at a midnight hour while waiting for his first child to be born. He was then thirty-one years old. Though oft quoted, it is worth quoting again as a revelation of the aspirations of one scientist:

> To smite all humbugs, however big; to give a nobler tone to science; to set an example of abstinence from petty personal controversies, and of toleration for everything but lying; to be indifferent as to whether the work is recognized as mine or not, so long as it is done.

Great words! And greatly did Huxley fulfil them! His championship of the truth as he saw it at every opportunity and against all comers is an inspiration, and his smiting of humbugs a joy to read about. Perhaps he would have set a still nobler tone if he had aimed "to smite all humbug" instead of "to smite all humbugs". That "s" reveals a tendency to play the man rather than the ball. He was apt, too, to interpret the class "humbugs" rather widely, and that at times blunted his other aspirations. For it is one thing, in a moment of solemn meditation, to contemplate noble aims; it is quite another to maintain them in the zest of battle.

It is rare to find in one man both researcher and apostle, for they are different qualities that make for success in these two fields. Indeed, as Huxley became the master teacher and controversialist, the research worker receded. But the research world is grateful for its vindicators. It, as well as the larger world, needs its Huxleys who remember so faithfully and effectively that (as he said at the age of thirty-five years) "we shall have certain duties to perform to ourselves, to the outside world, and to science".

The researcher must remember that there is a world outside his laboratory. He works in a sheltered place, and should, in fairness, consider the position of those who provide the shelter. In the past, private benefactors have often been responsible. In the present we look more and more to public or semipublic funds, and the administrators of these funds must justify to the public or their representatives the spending of money on research. To a scientific audience no apology for research is called for. But it becomes the researcher's duty to supply administrators with appropriate information concerning his aims and his results and their significance. And opportunities should be taken from time to time to give such information to the general public. Thomas Huxley found time in an extremely busy life to give series of lectures to working men, and those lectures supplemented his more formal broadsides to the learned societies in spreading the gospel of evolution.

The researcher will, of course, perform his main service to humanity by working in his laboratory; but he is also a citizen and cannot shut his eyes to the turmoils that perplex and corrode the world. He will from time to time feel urged by a sense of larger duties to emerge from seclusion and endeavour to assist in so far as he is able towards the integration of the community.

Among the researcher's duties to science is to remain true to the faith that is in him. In the Middle Ages this might involve him in dangerous conflict with authority. (Authority has always been the *bête noire* of science.) In some parts of the world this danger still exists.

Vavilov[13] was a distinguished Russian botanist with a world-wide reputation, who had made notable contributions to genetics. He was Director of the Institute of Plant Industry at Leningrad. As with all reputable geneticists, his work was based on the principles of Mendel and Morgan. He criticized severely some crude ideas on genetics put forward by a Russian colleague, whereupon the colleague proclaimed that the principles of Mendel and Morgan were bourgeois and not in accord with Marxism. This clever appeal to political prejudice succeeded, and in 1940 Vavilov was dismissed from his position and imprisoned. He apparently died in gaol in 1943.

Another example of persecution of a somewhat different type comes from the opposite end of the political spectrum.[14] Bernardo Houssay, Professor of Physiology at Buenos Aires, brought distinction to his country through his researches in endocrinology and particularly by demonstrating the importance of the pituitary gland in carbohydrate metabolism. In 1946 he was deprived of his chair because he protested against political intervention in the affairs of the university. In view of this injustice, the award to Houssay in the following year of a Nobel Prize was particularly pleasing.

In deploring these recent examples of persecution, we recall that it is not very long ago—only in 1897—that Ronald Ross met with official opposition to his research work.[15] As an officer of the Indian Medical Service he took a special interest in malaria. Its method of transmission was then unknown. After dissecting a thousand mosquitoes, Ross found a "dapple-winged" one with malarial parasites in its stomach wall. He reported this significant finding officially and five days later was transferred to a district free from malaria. No doubt his superiors regarded Ross with his preoccupation with mosquitoes as a fanatical nuisance that must be suppressed; they were still firmly rooted to the marsh miasma theory of origin. So people in India went on suffering from the "million-murdering Death", while Ross ate his heart out in bitterness and frustration, knowing he held the clue to the answer. Only the representations of Manson to the Secretary of State for India enabled him to return to his work.

The reputation of Ross, of Houssay, of Vavilov in the scientific world is secure—indeed, it is enhanced by their travail. And as to their persecutors, history has repeatedly shown the short-sightedness of making truth subservient to political expediency. By the inspiration of one independent thinker, Columbus, Spain was raised to the forefront of the nations. Then through the Inquisition she systematically destroyed her independent thinkers, and sank to the most backward position in western Europe. Again, one reason why Germany lagged behind in investigations of atomic energy was that the Nazis eliminated first-rate scientists and installed second-rate party men in their positions. In Britain and America, atomic research went on unhindered, and indeed the Allies profited from scientists that Hitler rejected.

Portrait of a Researcher.

One is tempted to wander on and on, like Columbus, through the fascinating realm of scientific biography; but it is time to take example rather from Hughlings Jackson and attempt a synthesis.

I have presented tonight a varied assortment of personalities. They are diverse in many respects. Have they any characteristic in common?

It is clear that neither race nor country is the common factor. No one appreciates this better than the researcher himself, for whatever his particular field of investigation, he knows how great is its debt to workers of other countries. He has colleagues throughout the world whose reports he studies carefully and with whom he corresponds. He shares freely with them information and experimental material. Especially with the medical researcher, his service is to humanity at large, for disease respects no national frontiers. With such an outlook race prejudice becomes absurd, although diversity of language remains an awkward barrier.

The greatest of researchers have had the rare quality of genius. This is a quality at which we can only marvel. The advent of a genius is unpredictable. When he arrives he is often unappreciated by his contemporaries. He cannot be organized into any scheme, for he creates his own world. All that planning can achieve in regard to genius is to provide suitable foci with the atmosphere of independent inquiry in which he can flourish, and to pray for the grace to recognize and encourage him if he appears.

Yet it would be wrong to suggest that discovery is dependent on genius, for this could serve as a soft excuse for inaction. It is encouraging to remember that many important discoveries have been made without the aid of genius, as well as a host of minor but still valuable ones.

As genius is unpredictable, so also is chance. Nor can it be planned for, otherwise than by creating environments in which it can be exploited.

In contemplating the greatness of some investigators, it would be easy to be led on into idealizing them. But that would give a false picture, even if we do not altogether accept Huxley's assertion that hero-worship is no better than any other form of idolatry. Researchers have had their share of human frailties and failures. The search for knowledge has not been altogether altruistic in motive. There have been petty secrecies and jealousies among rival workers, much discovery of mares' nests, stubborn adherence to false trails and erroneous conclusions, the crushing of one scientist by another. These must in honesty be mentioned, but are not to be emphasized, for it was not on them that discovery depended.

There is one inauspicious quality, however, that does appear to have a significant association with research; that is eccentricity, or sometimes rather a reputation for eccentricity. The memory of Hughlings Jackson was curiously erratic. He could never remember a patient's name, nor could he find his way to his own wards without a guide; but he could remember in the minutest detail any fact that bore on one of his own doctrines. Henry Cavendish, the millionaire investigator of hydrogen and many other things, was so morbidly shy that the mere introduction to him of a stranger at Sir Joseph Banks's house was sufficient to make him turn and run in terror.

Popular opinion, derived perhaps from such extreme examples as this, may have exaggerated the incidence of eccentricity. It may not necessarily be part of the make-up of a great researcher, but it is a risk to which intense devotion to a specialized field is apt to expose him. Joseph Bancroft was apparently free from it. His range of interests was broad. His membership in many bodies, and his attaining the presidencies of the Medical Society, the Medical Board and the Royal Society of Queensland, indicate that his medico-social relationships were active and sane.

Humility is frequently stated to be a facet in the research mind. This is not, however, always obvious. Some of my examples tonight possessed it, but it is not apparent in others. Columbus was not without humility, but he demanded the ranks of admiral and viceroy as conditions of his expedition. If it was present in Ronald Ross, it was obscured by pugnacity and querulousness. It is hard to trace much humility in certain researchers in psychiatry, though I understand that the rival schools are nowadays becoming at least polite to one another.

Some have been able to combine humility in the laboratory with aggressiveness towards their fellows. This is understandable, for while the finding of truth calls for humility, its promulgation may require different qualities. Which brings us again to Thomas Huxley. On the platform, in combative mood, he could antagonize a listener (Magee) with "his bumptious air of omniscience". But from the same Huxley at an earlier period had come the clearest affirmation of humility. It was evoked by a letter of sympathy from Charles Kingsley when Huxley's four-year-old son died—the same child whose arrival had inspired his statement of aims. In that sacred moment there stands revealed a soul free from base alloy:

> Science seems to me to teach in the highest and strongest manner the great truth which is embodied in the Christian conception of entire surrender to the will of God. Sit down before fact as a little child. . . .

(There is a world of poignancy in that reference to a little child.)

> . . . be prepared to give up every preconceived notion, follow humbly wherever and to whatever abysses nature leads, or you shall learn nothing.

Ranking with this is Michael Faraday's remark:

> That I may be largely wrong I am free to admit. Who can be right altogether in physical science which is essentially progressive and corrective?

Perhaps the finest expression of research humility is the one Kipling, with his extraordinary insight into the souls of men, puts into the mouth of his explorer:

> I crossed the range to see.
> God forgive me! No, *I* didn't. It's God's present to our nation.
> Anybody might have found it, but—His Whisper came to Me!

Another significant trait is industry. Bancroft's famous discovery was not the result of casual observation. "I have laboured very hard", he wrote, "to find the parental form of the parasite." We can well believe it. The slenderness of the worm would make it difficult to find, particularly to one still unaware of its appearance or where to look for it.

It is true that the dilettante has had occasional triumphs, but more usually success has demanded sustained application to the chosen task. "I have worked as hard as I could", said Robert Koch. We see Dobell making his innumerable examinations, Jackson writing his three hundred papers. We see Ronald Ross at Secunderabad examining the stomach of his thousandth mosquito through the cracked eyepiece of his microscope, while the sweat dropped down on its rusting mechanism. There is an immensity of tedious labour in the background of research.

Truth for its Own Sake.

So far as I have gone the attempt to supply a composite picture of the researcher has been only slightly successful; there has been too much diversity for clear definition. He may belong to any race or nation. He is, rarely, a genius; much more often not. He is humble, at least in some respects. He is engrossed in the subject that he has chosen or that has chosen him. He is alert for the new and significant and sometimes is favoured by happy chance. He may stand perhaps a little apart from his fellows, listening to different music.

But now we come to the one unifying quality, the thread that runs through the story of every researcher—the desire to add to knowledge. Each in his own field and in his own way has sought for truth; truth, whether it came in the flash of inspiration or by patient observation; truth tested in the fire of experiment or hammered out by disciplined thinking; truth in matters of the minutest detail; accordance with all known truth fundamental in the broadest philosophical theories; truth to be suffered for in times of persecution and battled for where ignorance and prejudice prevail; always truth as the aim; to be sought for its own sake; its discovery its own sufficient reward.

This is the vision that he sees, and though it is sometimes obscured by passing clouds, to it he remains faithful. There is no flirting with the pernicious Nietzschean doctrine that truth is a moral prejudice. There is no worship of the false modern god, propaganda. It would

be foolish to under-estimate the power of skilfully directed propaganda to mislead the public; but the researcher takes with the poet Bryant the long-range view:

> Truth crushed to earth shall rise again;
> The eternal years of God are hers;
> But error, wounded, writhes with pain,
> And dies among her worshippers.

One realizes that the search for truth does not in itself provide a complete philosophy of life—as indeed scientists themselves have demonstrated. Francis Bacon (1561-1626) possessed one of the greatest intellects of all time. For three centuries his writings have had a profound influence on the course of science. He conceived a comprehensive plan for disclosing the secrets of nature by observation and experiment on the grand scale. He felt himself that he was fitted for nothing so well as the study of truth. Yet all his knowledge did not avail to save him from taking bribes, from trampling on his benefactors to obtain advancement, and from a fawning sycophancy. Moral flaws destroyed ingloriously the career of one who aimed at nothing less than "the enlarging of the bounds of Human Empire, to the effecting of all things possible".

More than scientific knowledge is clearly necessary to make up the complete personality and to build through integrated personalities the world as it should be. Even before our Lord taught the supremacy of love, prophets had insisted on righteousness, and philosophers had taught that the true should be sought in combination with the good and the beautiful. When new truth has been acquired, it has to be intelligently applied and dedicated to a right end.

Nevertheless scientific research has yet, within its sphere, a notable contribution to make to human welfare. There are many pressing medical problems unsolved, and still more urgent problems outside the medical field—particularly in the field of human relationships. The inequitable distribution of possessions and privileges, problems of crime and the criminal, of domestic and industrial dysharmonies, the oppression of minorities, national jealousies and misunderstandings, all challenge the spirit of the researcher as well as the statesman. When we look at the great progress already achieved by research in physical science and in medicine, may we not look forward hopefully to equal advances in sociology if its problems are attacked in the spirit of scientific inquiry combined with goodwill?

Acknowledgements.

The theme of this oration was largely suggested by Walter Cannon's book "The Way of an Investigator". Its substance represents an acknowledgement of my indebtedness to the stories of the pioneer researchers, and I would pay my tribute also to that other inexhaustible fountain of inspiration—the writings of the poets.

There is one that we have missed tonight, who used never to be absent from such an occasion as this when we meet to pay homage to our heritage. I refer to the late S. F. McDonald. "S.F." was, to use his own words, a genuine worshipper in the temple of scientific truth, and I am grateful to him, not only for his scientific contributions and his encouragement of medical research, but also for his mind-expanding articles on the relation of medicine to history and literature.

I am grateful also to Mrs. M. Macgregor, librarian at the Queensland Institute of Medical Research, for many references, to Professor H. J. Wilkinson, Dr. I. M. Mackerras, Mr. J. P. Callaghan, M.Sc., and the Reverend T. Bainbridge, B.A., for material from their libraries, and to Mr. A. T. S. Sissons, Dean of the College of Pharmacy, Melbourne, for information.

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INFECTION: A HOSPITAL PROBLEM.[1]

By SYDNEY D. RUBBO,
Professor of Bacteriology, University of Melbourne.

INFECTION may be regarded as the wanton destruction of the host, or host tissues, by the parasite. The process is one of balance between virulence of the parasite and resistance of the host. This balance may shift between the extremes of complete freedom from symptoms or death, with disease at the clinical level poised at some intermediate point.

During the past century the problem of infection in hospital has been one which has exercised the minds of many outstanding pathfinders in medicine. So successfully has the germ theory of disease been assimilated into medical science that today unseen Nemesis of death by infection contracted in hospital seldom enters into the experience of the practising surgeon, physician, obstetrician or pædiatrician. And yet it does occur, but stripped of the quality of repeated tragedy and failure which characterized the work of surgeons during the first twenty years of this hospital's existence. It is perhaps difficult for those who are not familiar with the history of medicine to realize that the greatest obstacle to progress in surgery and in obstetrics during the early part of the nineteenth century was the problem of sepsis. I think it appropriate and in keeping with the present occasion to develop the subject of hospital infection on an historical basis encompassing the temporal span of one hundred years from 1848 to 1948.

It will be convenient to subdivide our material into three main chapters, the first dealing with historical backgrounds, the second with recent impressions, and the third with the problem of control.

HISTORICAL BACKGROUNDS.

In 1848 there existed hospital diseases seldom encountered today. The classical tetrad was erysipelas, pyæmia, septicæmia and hospital gangrene. Erysipelas occurred sporadically and frequently; pyæmia arose from the dissemination of infected emboli; septicæmia implied bacteriæmia in the absence of thrombosis, and hospital gangrene, a spreading necrosis of tissue, frequently accompanied amputation. So great was the mortality due to sepsis, and so little of its nature was understood, that wards were continually being closed, and in Nuremberg the destruction of the general hospital was contemplated. Healing by first intention was the exception, not the rule. The only undisputed fact in the vortex of confused ideas was that dirt and overcrowding favoured sepsis. From this observation arose the first, and not very successful, attempt to control infection in hospital. Fresh air and cleanliness were demanded. Thus wards became larger, not unlike the type we know at the old Royal Melbourne

[1] This lecture was delivered during the centenary celebrations of the Royal Melbourne Hospital in March, 1948.

Hospital; sunshine and fresh air were admitted as prophylaxis against the "good old surgical stink"; communal roller towels and wash basins containing water tinted with permanganate were installed in all wards. These were the barricades of 1848. But none the less the marine sponge and the dirty probe passed from patient to patient as the surgeon made his ward round, attired, as was the custom, in a coat stained with blood and the products of suppuration. We may smile at these futile attempts, but in so doing we must remind ourselves that the germ theory of disease yet remained unknown.

Nor was this problem of sepsis peculiar to surgical wards. Puerperal infection just prior to 1848 was something more than a hospital problem—it was death to every tenth woman admitted to labour wards. In the years from 1841 to 1846 the statistics for the Maria Theresa Lying-In Hospital in Vienna showed that the mortality due to puerperal infection was 9·9% in the first division, attended by the medical students, and 3·5% in the second division, attended by midwives. The true figure for the first division was even worse, for it was the custom to transfer very sick women to the wards of the general hospital. Hence these deaths do not appear in these vital statistics. None could understand why the mortality in the students' division should be so much higher than that of the midwives. If the diagnosis and autopsy findings agreed, then the patient, or, more correctly, the unfortunate relatives, had little to complain of; the patient at least "died diagnosed". I cannot describe here the whirlpool of conflicting theories which centred on this vexatious problem. The limiting factor was absence of any knowledge of the ætiology of puerperal fever, and this factor could be by-passed only by the chance observation of a genius. That genius was Ignaz Philipp Semmelweis.

In 1847, Kolletschka, a pathologist and a friend of Semmelweis, died as a result of a cut inflicted during autopsy. With irresistible clarity Semmelweis saw that his friend had died from a disease identical with that which claimed so many of his patients in the labour wards. Acting on this inspiration he instituted chlorine disinfection between the cadaver and the patient. No longer would the students receive their practical instruction on cadavers, assist in autopsies and then proceed to do their ward rounds without first sterilizing their hands in a bath of chlorine solution. The death rate immediately dropped from 10% in 1847 to 1% in 1848. Then calamity descended on the ward. Eleven out of twelve women died of puerperal fever, not because of cross-infection from the autopsy room, but following the examination of a woman who had a foul-smelling cancer of the cervix. Now Semmelweis knew that the infected patient as well as the cadaver was dangerous. In 1848 his doctrine was clearly established, but not universally adopted. Without fear of contradiction we may claim that Semmelweis was the first to introduce antisepsis as a prophylactic measure both in obstetrics and in gynæcology. It is impossible to overestimate his contribution to mankind. He died of a neglected infection of the hand in the Vienna Insane Asylum at the age of forty-seven years.

It is little wonder that the state of mind of the medical profession was one of doubt and uncertainty. In 1848 the hospital was the portal of death rather than the haven of healing.

No essay on infection in hospital would be complete without mention of the work of Joseph Lister. He first addressed himself to the problem of sepsis in wounds when he was professor of surgery at Glasgow and had charge of the male accident ward in the Glasgow Infirmary. From Pasteur's writings he learnt that putrefaction was caused by microorganisms, which were carried far and wide by dust, and that heat and filtration could free the dust of these living agents. Lister immediately deduced that microorganisms were also responsible for infection of wounds, and from this concluded that the success of wound treatment depended not on treating the infected wound, but on preventing the infection from establishing itself. He was the first medical man to apply the germ theory of disease to the practice of surgery. For prophylaxis Lister depended almost entirely on a 1 in 20 aqueous solution of carbolic acid. This was an unfortunate choice, as we shall see presently, and carbolic acid was replaced in 1889 by Lister's salt, the double cyanide of mercury and zinc. His first paper on the new antiseptic treatment was published in 1867, and in it he wrote as follows:

> Since the antiseptic treatment has been brought into full operation, my wards, though in other respects under precisely the same circumstances as before, have completely changed their character; during the last nine months not a single instance of pyæmia, hospital gangrene or erysipelas has occurred in them.

In spite of the fact that his antiseptic treatment was successful, lack of understanding and opposition remained. The hospital authorities of the Glasgow Infirmary claimed that Lister's success was due to better ventilation, better diet and better nursing; but in this explanation they failed to note that these improvements were common throughout the hospital, whereas the mitigation of sepsis was restricted to Lister's wards. More serious than this local prejudice was the opposition of eminent surgeons, such as Sir James Simpson, of Edinburgh, and the London school, who followed Liston's teachings on the merits of water dressings. It was claimed that Lister contributed nothing new to medicine, for Lemaire, of France, had already exploited the use of carbolic acid in 1860 and 1865. The bigoted opposition refused to see any distinction between the drug Lister used and the manner in which he used it. Lister never claimed to have discovered carbolic acid, although he was unaware of Lemaire's work. But he did claim to have discovered the antiseptic method—that is, the dressing of wounds with antiseptic to ensure the absence of putrefaction. The selection of carbolic acid was purely fortuitous, having been suggested to him by Dr. Cameron, the professor of chemistry at Glasgow. Further, had Lister known of Semmelweis's work, he would in all probability have used chlorine.

From the modern point of view the Listerian principles are somewhat disappointing. In the first place, attention was concentrated on the air as the primary source of septic infection. This was an improper premise. The air was the vehicle, but not the source. Furthermore, while the perils of air-borne bacteria were accentuated, little distinction was drawn between disease-producing and non-disease-producing organisms. Accordingly, we find the Listerian practice going to extraordinary lengths to control the flying microbe. In 1871 Lister developed the first aerosol spray, consisting of a cloud of carbolic acid vapour calculated to destroy all life in its vicinity except that of the surgeon, his assistants and the patient. This was abandoned six years later.

In 1890 a Listerian operation depended almost entirely on the use of 1 in 20 carbolic acid solution as a prophylactic. The operation was performed without a mask and with bare hands; no heat was used for sterilization, and there was no sterile gown, no cap, no skin preparation apart from swabbing with carbolic acid solution.

Gradually the teachings of Lister were embraced and then modified. At the beginning of this century the emphasis passed from antisepsis to asepsis. In 1890 Halsted introduced the use of rubber gloves. Ten years later William Hunter first used the gauze mask. However, the true apostle of aseptic surgery was von Bergmann, professor of surgery at Berlin. Von Bergmann recognized that the exclusion of pathogenic bacteria from a wound was an essential prerequisite to success. He introduced sterilization by steam as a means of destroying bacteria. At the same time he recognized that the tissues themselves possessed significant mechanisms of defence, particularly in the form of phagocytic cells. He was, of course, largely influenced by the work of Lister and also by Metchnikoff's discovery of phagocytic action in 1883. Not only did he influence the Continental and subsequently the English schools of surgery, but he also revolutionized hospital design. One of his institutions covered 136 acres, the operating blocks being well separated from wards. The pendulum had now swung a little too far in the interests of safety by isolation, but with little regard for convenience. It is interesting to note that as late as 1908, forty years after his first paper on antisepsis, Lister did

not willingly accept this new doctrine of asepsis. It grieved him to learn that many surgeons had been led to substitute needlessly protracted and complicated measures for means so simple and efficient.

It is a curious thing that the student today may read his surgical text-books and gain not the slightest idea how it is that surgery acquired the safety and flexibility it now enjoys. He knows that asepsis is important; he does not know that it was the limiting factor to progress fifty years ago. The conscientious student who reads "Rose and Carless" will be informed that the aseptic method of treating wounds consists in the elimination of chemical antiseptics and the substitution of heat as a sterilizing agent. Other text-books, with the exception of one American volume, do not give even as much information as I have quoted, limited and misleading as it is. For this reason I feel it my duty to state the obvious here. Only three important principles must be borne in mind in discussing asepsis: (i) the exclusion of bacteria; (ii) the removal of bacteria; (iii) the destruction of bacteria. If these three principles are securely grasped, then it is a matter of common sense, a little technical knowledge and a strict discipline to apply them.

RECENT IMPRESSIONS.

In this section I will make no attempt to review the voluminous literature during recent years on the subject of hospital cross-infection. The fact that no less than 180 papers have been published on this subject in the English language since 1940 is sufficient testimony of its importance. In place of these fertile sources of information I propose to substitute some rather slight observations of my own. Accordingly, I propose to discuss the incidence of post-operative wound infections and the problem of gastro-enteritis among infants.

The modern surgeon, as we know from experience, seldom encounters a post-operative infection serious enough to endanger the life or livelihood of his patient. It is understandable, therefore, that he should cease to think of infection as a personal or hospital problem. However, if we look to the results of surgery today, we shall soon discover that infection still remains a serious problem, not so much from the point of view of the surgeon or his patient as from the point of view of the institution in which he practises.

The service any hospital renders to the community is assessed on a summation of qualities, one of which is the number of patients it can treat *per annum*. This number depends on two factors, the actual number of beds available and the average stay in hospital of the patients. Circumstances which reduce the former—for example, shortage of staff—or increase the latter—for example, wound infection—must lower the working efficiency of the hospital.

In order to discover whether infection played such a role in a first-class hospital, the histories of 203 patients who had been subjected to radical mastectomy for carcinoma of the breast were examined. This operation was selected because it could be regarded as a uniform operation of election on a non-infective lesion, but at the same time presenting a severe test of aseptic surgery.

The first and most important finding was that only one post-operative death occurred which could be attributed to infection, and this was due to post-operative pneumonia. The wound infections were in general trivial and would hardly be brought to the notice of the surgeon by his resident medical officer. However, a number were of a serious nature. The findings of this survey are shown in Table I.

It will be noted that the incidence of post-operative wound infection is surprisingly high and shows little or no change over a period of fifteen years. Further, there is a significant increase in the duration of stay in hospital of those patients who developed wound infections. I do not think this trivial complication is peculiar to the operation in question or to this hospital, but I believe it would repeat itself to a greater or less degree for all types of surgical work. It seems safe to predict that the infection incidence would be greater in cases of cystostomy and cholecystectomy and less in cases of thyreoidectomy and herniotomy. From the foregoing figures we might venture to speculate on the overall average increase in duration of stay in hospital due to more or less trivial wound infection. A conservative estimate would probably be in the vicinity of ten days for 5% of all patients admitted to surgical wards. In a 500-bed general hospital admitting approximately 8000 patients *per annum*, the average number of surgical patients treated would be approximately 5000. If 5% of these contracted trivial wound infections, this would mean that 250 patients would be in hospital for ten days longer than the normal period. In other words, 2500 patient-days would be wasted *per annum* at a cost of £3,750, if it is assumed that one patient-day costs £1 10s. Replicate this figure for the surgical cases in the metropolitan area, at a guess 20,000 *per annum*; then the economic wastage in the city of Melbourne amounts to the staggering figure of £15,000 *per annum*. Even if these calculations over-estimate this invisible expenditure, we must agree that infection in hospital is a problem to be measured not in terms of human suffering, but by the mercenary yardstick of pounds, shillings and pence.

TABLE I.

Analysis of Post-operative Wound Infections following Radical Mastectomy.[1]

Years.	Post-operative Result.	Number of Cases.	Average Age of Patients. (Years.)	Incidence of Wound Infection.	Average Stay in Hospital. (Days.)
1932 to 1944 (Old Royal Melbourne Hospital).	Infection present.	49	56	32%	34
	Infection absent.	104	53	—	19
1945 to 1947 (New Royal Melbourne Hospital).	Infection present.	15	58	30%	29
	Infection absent.	35	57	—	16

[1] Infection is present if (a) the temperature is greater than 100° F. on two successive days and topical or general chemotherapy is instituted; (b) the temperature is less than 100° F., but the history states that infection is present and the wound is discharging. Upper respiratory tract infections are not included; the figures showed an incidence of 4·4%.

I should now like to divert the trend of these remarks from surgery to medicine. To this end a brief account of an epidemic of gastro-enteritis in infants will be described. In 1946 there occurred an epidemic of gastro-enteritis in Melbourne due to an organism of comparative rarity in Australia, *Salmonella derby*. Prior to this outbreak, which included 68 cases and carriers and resulted in ten deaths, only seven cases of *Salmonella derby* infection had been detected in Australia and none in Victoria. In the initial cases the children were admitted to hospital with the diagnosis of gastro-enteritis and on bacteriological examination were found to be harbouring *Salmonella derby*. The cases appeared to be unrelated to one another in point of time, and they arose in widely separated geographical areas. In two cases it appeared that infection was contracted outside Australia, as the patients were admitted to hospital immediately on arrival in this country.

After these primarily infected patients had been admitted to hospital other cases of gastro-enteritis began to develop spontaneously in the wards. Twelve infants suffering or recovering from broncho-pneumonia, five admitted to hospital with the diagnosis of dietetic problems, others suffering from bronchiolitis, pyloric stenosis, meningitis, hare-lip *et cetera*, developed gastro-enteritis due to *Salmonella derby*. In short, it rapidly became apparent that we were dealing with a problem of serious cross-infection.

The smouldering nature of the outbreak and its localization in two wards (illustrated in Figure I) clearly indicated that infection was occurring in the wards. As the portal of entry of this gastro-intestinal pathogen was via the alimentary canal, it was concluded that the cases arose from the intermittent contamination of isolated feeds given in the wards.

It is beyond the scope of this paper to discuss in detail our findings or to indicate the methods of control. These will be published elsewhere (Rubbo, 1948). However, it was most instructive to follow the distribution of the pathogen in the ward environment. *Salmonella derby* was recovered from the dust of the ward floors, from the dust on top of a linen cupboard, from a mouse caught in the ward, from a communal roller towel, from the floor of the soiled linen annex and from the stools of 21 infants showing no gastro-intestinal symptoms. The problem of determining the probable pathways of infection was largely resolved by these findings, which were used as the basis upon which restrictive measures were recommended. The diagram in Figure II illustrates these pathways, the novel feature being that gastro-intestinal infections may arise not only through the accepted mechanism of contact with food, but also through dust contamination of the food.

This local outbreak, which, I may add, was the largest yet recorded for *Salmonella derby* in humans, once more focuses attention on the tragic reality of cross-infection in hospital—this time in terms of human life.

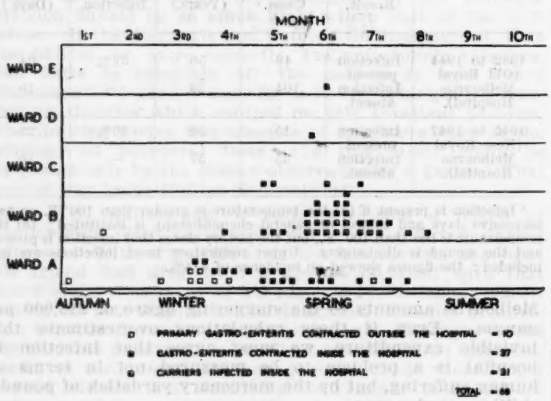

FIGURE I.

THE PROBLEM OF CONTROL.

By the devious and perhaps meandering path of history, recent and remote, I have attempted to show that infection still remains a hospital problem, but of a different kind and quality from that seen in Lister's time.

Let me now direct your attention to some simple and complex procedures of reducing this incidence of cross-infection in hospital.

I have already stated the principles underlying asepsis, and it might be assumed that the practical application of these will immediately resolve our problem. This is not so. Unless we know something of the other side of the story—namely, the source and distribution of pathogenic bacteria, their survival time outside the body and their mode of transmission—we shall, in our attempts, behave like the crazy genius who was shooting at something no one else could see—and missing it.

It is impossible in the time available to discuss these three aspects. On the first point we are all fairly well informed, on the second even the specialists are in the dark, and on the third, the mode of transmission, we may dwell for a few moments.

We may classify the spread of infection in hospital under five general headings: (i) contact infection (direct or mediate); (ii) droplet infection (direct or mediate—air-borne); (iii) droplet-nuclei infection (direct or mediate—air-borne); (iv) dust-borne infection (air-borne); (v) insect-borne infection.

The prevention of infection, no matter whether it is gastro-enteritis in infants or tuberculosis among nurses, must be considered, with the appropriate emphasis, at three different levels. Broadly our aim is to prevent or reduce contact, air-borne and insect-borne infection pathways. This can be approached in three ways: by attempting to eliminate the primary and secondary reservoirs of infection, by imposing physical and chemical barriers against spread, and finally by increasing the resistance of the host by immuno-prophylaxis or chemo-prophylaxis.

Elimination of Primary and Secondary Reservoirs of Infection.

For the purpose of this discussion we shall label the healthy human carrier or the patient with a manifest infection the primary reservoir, excluding rodents, parrots and other forms which find it difficult to gain admission to, let alone survive in, the modern hospital. From the practical point of view it is impossible to detect every

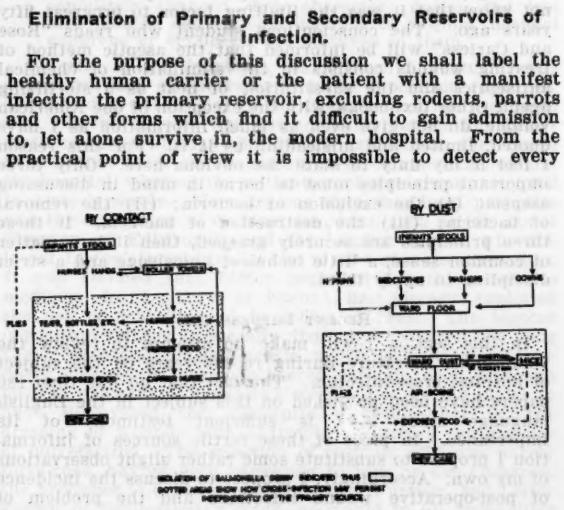

FIGURE II.

carrier of potential pathogens or to isolate every person who becomes infected. To aim at this would result in nothing but chaos. However, it is possible, and in the long run would be economical, to initiate some bacteriological control over these primary sources. For example, in surgical wards, including general, orthopædic, thoracic, neurosurgical, plastic and burns units, routine swabbing of the nose and throat of surgeons, nurses and patients for *Staphylococcus pyogenes* and *Streptococcus pyogenes* should be carried out. In obstetrical wards routine swabbing of the nose and throat of obstetricians, students, nurses and patients for *Streptococcus pyogenes* should be carried out. In pædiatric wards a routine bacteriological examination of the fæces of all patients aged under two years should be made for Salmonella and other enteric

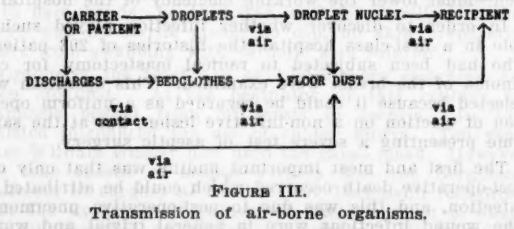

FIGURE III.

Transmission of air-borne organisms.

pathogens. In mental institutions routine examination should be made for *Salmonella typhi* by Vi agglutination and cultural examination of the fæces of all persons handling or preparing food. By this means some measure of control over the unsuspected carrier could be exercised.

With regard to the management of patients with manifest infection, this is largely a matter of hospital organization. It may be suggested, however, that in surgical wards the following dressing technique, modified from McKissock, Wright and Miles (1941), might be adopted. This *régime* is based on the assumption that one of the main causes of wound infection is the carry-over of infected discharge from one patient's wounds to another's by members of the medical or nursing staff.

At least three persons are required for a dressing team. They are: (i) a "dirty" nurse, (ii) a "clean" nurse, (iii) a "dresser" nurse (or resident doctor).

The members of the team are masked (nose and mouth being covered) and wear sterile gowns. A two-shelf trolly is required, the upper shelf being reserved for sterile equipment, the lower shelf for contaminated material. On the upper shelf, drugs, sterile instruments, sterile dressings, bandages and tissue towelling and a bowl of disinfectant solution (1 in 200 "Zephiran" solution or 1 in 100 "Cetavlon" solution) are carried and the whole is covered with a sterile towel. On the lower shelf, four bowls of disinfectant solution are placed, three containing 1 in 200 "Zephiran" solution or 1 in 100 "Cetavlon" solution, and one containing 1 in 100 "Zephiran" or "Cetavlon" solution.

The "clean" nurse wheels the trolly to the bedside and is responsible for handing sterile dressings and instruments to the "dresser" nurse and for supervising the discarding of soiled instruments. The "clean" nurse is the only person removing articles from the sterile shelf, and before doing so she immerses her hands in a bowl of disinfectant solution on this shelf. She "scrubs up" before and after each ward round.

The "dirty" nurse prepares the patient for dressing by removing the bandages and soiled dressings, the latter being placed in the first bowl on the lower shelf of the trolly. It is also the duty of the "dirty" nurse to replace the bandages after the wound has been dressed. She sterilizes her hands and forearms by washing them for one minute in the second bowl before and after attending to each patient. The "dresser" nurse (or resident doctor) attends only to the treatment of the wound exposed by the "dirty" nurse. She, too, must sterilize her hands and forearms in the third bowl and dry them with tissue towelling handed to her with forceps by the "clean" nurse. In hospital the resident doctor should not only supervise the setting of the trolly according to the anticipated requirements of his patients, but also should act as the "dresser" nurse in order to institute appropriate treatment with each exposure of a patient's wound.

In the event of a shortage of instruments, the "dresser" nurse may immerse a used instrument in the bowl of 1 in 100 "Zephiran" or "Cetavlon" solution placed on the lower shelf of the trolly. After five minutes the "dirty" nurse may remove this instrument, clean it with gauze and then return it to the bowl on the top shelf of the trolly.

In addition to these precautions certain general ward rules should be enforced. Firstly, all bed-making, sweeping and other activities likely to raise dust should cease one hour before the dressings commence. These activities should be done with ward windows open, whereas at the time of the dressings the windows should be closed. Further, linen must never be sorted in the ward, nor must bedclothes be transferred from one bed to another. Finally, not more than one dressing should be removed at the one time, and in the case of multiple wounds each must be dressed separately.

The dressing technique described above is designed to eliminate contact wound infection. It would be misleading if I gave the impression that contact transmission was important only in surgical wards. On the contrary, contact infection may declare itself in more serious forms than wound infection. For example, acute enterotoxæmia due to staphylococcal infection of food, or salmonellosis and dysentery in infants or typhoid fever in mental institutions, frequently result from contact infection of food by carriers of these pathogens. The control of these infections depends entirely on the detection of carriers as already discussed, and on the adoption of aseptic ward and kitchen hygiene.

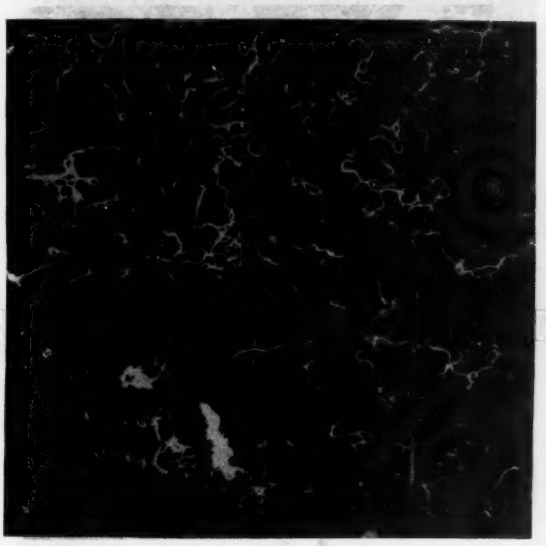

FIGURE IVA.

Particle fixation by oiling of blankets. Particles liberated from blanket before oiling. Approximate number of particles per square inch, 20.

FIGURE IVB.

Particle fixation by oiling of blankets. Particles liberated from same blanket as in Figure IVA after oiling. Approximate number of particles per square inch, four.

Physical and Chemical Barriers against Spread of Infection.

Dust Control.

So much has been written in recent years on dust control in hospital that it would be tiresome to extend this subject here. I will refer briefly to what is considered the most efficient, most economical and simplest means of reducing dust-borne infection—namely, the oiling of floors and bedclothes.

This technique was first exploited by Van den Ende, Lush and Edward (1940 and 1941), and experience since then has amply justified its value. No doubt now exists of the role played by blanket dust in transmitting airborne infection in hospital, whether the infection is localized to the upper respiratory passages, to the alimentary tract or to surface wounds. Oil, in the form of crude spindle oil or paraffin oil, causes the fixation of particles to the surface over which it is spread by reducing

the surface tension at the air-material interface. In the diagram in Figure III it will be seen how the oiled surfaces of bedclothes and floors can effectively break the transmission of infective particles.

It will be noted that there is a general tendency for air-borne particles to gravitate towards bedclothes and floors before finally reaching the recipient. Hence any mechanism, such as oiling, capable of fixing the organism at one or both these stages of transmission must be effective in reducing the incidence of air-borne infection. At the same time it should be noted that the air-borne droplets and droplet nuclei are unaffected by the technique of oiling.

In order to demonstrate the particle fixation capacity of oiled blankets and floors, a few simple experiments are illustrated in Figures IV and V.

The method of testing the blankets was as follows. Two strips of blanket, one oiled, the other not oiled, were agitated by being stretched three inches above an oiled

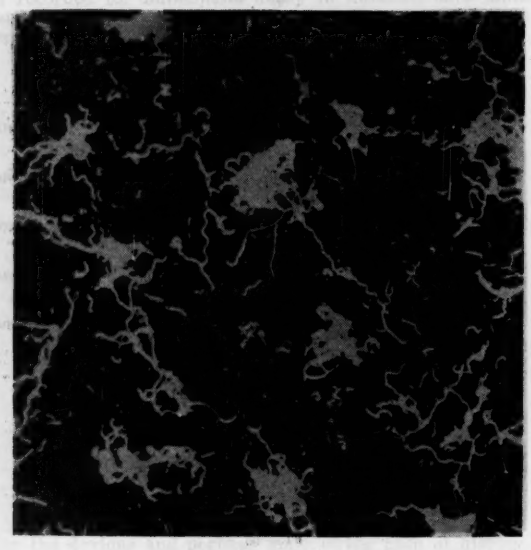

FIGURE VA.
Particle fixation by oiling of floors. Oiled floor. Particles present before fanning.

wood surface. The particles liberated from each were trapped as shown in Figures IVA, IVB, VA, VB, Vc and VD.

These experiments are so simple that they require no amplification here. They do show the significant difference in dust-retaining properties between an oiled and an ordinary blanket (Figures IVA and IVB), and emphasize the superiority of dust fixation by an oiled floor (Figures VA, VB, Vc and VD).

As to the details of oiling of bedclothes, the reader should consult a paper by Harwood, Powney and Edwards (1944) which describes the technique in detail. In addition, an interesting contribution to this subject is made by Rountree (1946), who showed that the cationic detergent "Fixanol C", recommended by Harwood *et alii*, will impart a bactericidal action to an oiled blanket provided the concentration of 1 in 800 is reached. The oiling of floors is fully described in the Medical Research Council War Memorandum Number 11 (1944).

There is, however, another aspect of dust control upon which I should like to enlarge. It will be noted from the work of Bourdillon and Colebrook (1946) that infected dressings shed enormous numbers of bacteria into the air. These authors were primarily concerned with the management of burns, and an attempt was made to eliminate sepsis by performing all dressings in a small room, hereinafter termed a dressing station. The important feature about this station was that the atmosphere was rendered reasonably safe by positive air ventilation and by air filtration. In their experience of more than 1400 dressings over a period of twelve months not a single patient became infected at the time of dressing, although 8% acquired added infections in the wards due to imperfect cover of the burnt areas. The work of these authors raises two points worthy of comment.

In the first place, air ventilation for dressing stations or operating theatres should be designed on the plenum system—that is, positive air pressure should be provided at a supply rate of 20 to 30 changes of air per hour. In this type of forced ventilation it is important that the air flow enters at ceiling height and that the air is warmer than the surrounding walls. By this means a "piston" or layer of warm air is formed and is constantly being forced towards the floor, which is oiled, carrying with it invisible clouds of bacteria liberated from the dressings. Secondly,

FIGURE VB.
Particle fixation by oiling of floors. Oiled floor. Particles present after fanning by means of small electric fan.

although these authors used glass-wool and cotton-wool filters, I should like to commend to your notice a filter of an entirely different nature. I refer to the electrostatic method of filtration. In this method suspended particles are positively charged as they pass through an ionizing electric field and then are carried through a series of negatively charged metal vanes or louvres. The fate of such particles is amply illustrated in Figure VI.

From personal experience I consider that this method of air filtration will remove air-borne bacteria. The superiority of electrostatic over mechanical filtration is shown by comparative blackness tests recorded in Figure VII.

So far we have no burns unit in any of our teaching hospitals. When one recalls the relatively high percentage of surgical wounds which become infected, one can confidently predict a high infection rate in cases of burns. The number of these cases may not be large—actually the admission rate to the Royal Melbourne Hospital is about 90 *per annum*—but they can become a serious problem in hospital organization as primary and secondary reservoirs of infection. It is my opinion, therefore, that it would be advantageous to all concerned to centralize a burns unit in one of our teaching hospitals with appropriate annexes for plenary and plastic treatment, for treatment of shock and for dressings.

In summarizing this section of the control of dust-borne infection my recommendations are as follows: (i) oiling of all bedclothes in all wards; (ii) oiling of floors in surgical, obstetrical and pædiatric wards; (iii) air filtration and positive ventilation for operating theatres and dressing stations.

Droplet Control.

With regard to droplets and droplet nuclei, the latter being dehydrated droplet particles of small dimension and capable of remaining air-borne for considerable periods of time, the problem is not so simple. Droplets leave the host in the atomized spray from nose and throat in sneezing and coughing and during conversation, as shown in Figures VIII, IX and X.

It will be noted (Figure X) that a heavy all-fabric mask is permeable to droplets forcibly ejected during sneezing. Hence it is advisable to use the fabric mask containing a layer of "Cellophane".

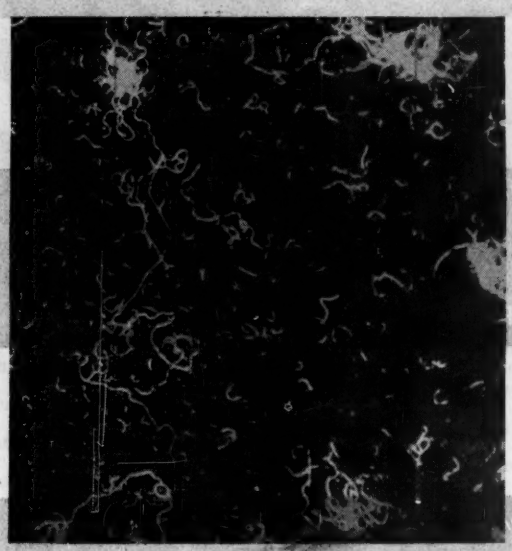

FIGURE Vc.
Particle fixation by oiling of floors. Non-oiled floor. Particles present before fanning.

A large percentage of droplets and droplet nuclei fall on surfaces such as bedclothes, floors, lockers *et cetera* and eventually contribute towards loading ward dust with potential pathogens (see Figure III). As dust suppression has already been dealt with, our interest here is centred on the air-borne droplet before it strikes a solid surface.

The simplest and most important method of control of droplet infection is to insist on the discipline of efficient masking. It is fully realized that it is impossible to mask all the people in a ward all the time; but we can insist on masking some of the people some of the time. In surgical practice masking is almost universally adopted during operation, but less frequently during post-operative inspection of wounds. The importance of masking during inspection of a wound is well illustrated in the following incident.

An ophthalmic surgeon recently performed three operations for strabismus and one for retinal detachment during four successive weeks. Each patient developed a fulminating staphylococcal infection about the fourth day after operation. On examination it was found that the surgeon was a nasal carrier of *Staphylococcus pyogenes*, and that it was his custom to inspect the site of operation on the second day without masking. This procedure was undoubtedly responsible for his failures, since a short course of penicillin nasal drops and the adoption of masking have completely eliminated any further post-operative infections.

In passing, this incident raises two points worthy of further comment. The first is the importance of detecting nasal carriers of *Staphylococcus pyogenes*, and the second is that wound inspection and changing of dressings should be reduced to a minimum during the first six days of the post-operative period. Admittedly this is not always possible, as in the present instance; but the surgeon should strongly resist any desire to inspect a wound unless pyrexia, hæmorrhage or pain dictates this.

In obstetrics masking during attendance in the labour ward and its examination annexes and in the ward during the first week of the puerperium is usually practised and to be commended. In pædiatrics masking during ward rounds among premature babies and infants under two years of age is now standard practice. Our aims in masking from the surgical and obstetrical points of view are to reduce wound infections and in the pædiatric wards to guard against upper respiratory tract infections.

FIGURE Vd.
Particle fixation by oiling of floors. Non-oiled floor. Particles present after fanning by means of small electric fan.

Apart from the physical barriers of oiling and masking, spread of air-borne infection can be effectively checked by the division of wards with glass partitions approximately seven feet high. This is known as barrier nursing.

Finally, I come to physico-chemical and chemical factors of arresting air-borne droplet or droplet nuclei scatter. Two methods are available—the use of ultra-violet light or of aerosols. Up to the present, studies of the value of ultra-violet light and of glycol vapour (propylene or triethylene glycol) suggest that both methods have a measurable effect upon the attack rate from certain respiratory diseases; but experience so far is not sufficient to allow definite conclusions to be drawn. Both these methods must be supplemented by dust suppression measures as already described.

In the use of ultra-violet light one can adopt direct or indirect irradiation. Direct irradiation has gained some popularity in America, particularly in thoracic surgery. But if this method is used, extreme precautions must be taken by the surgeon and his assistants to protect their skin and eyes from the irritating effects of the radiation. For this reason I think direct irradiation at the time of operation impracticable. Indirect irradiation, whereby "curtains" of ultra-violet light are projected at floor or at ceiling level, does not involve any personal risk and could effect air sterilization provided an efficient air circulation

system accompanied it. The large-scale adoption of ultra-violet light in general hospitals is yet to be exploited; but its value in pædiatric and premature baby wards, in sanatoria and in dressing stations is worthy of serious consideration.

The aerosol vapours of the propylene or ethylene glycol type are undoubtedly effective bactericidal agents. However, glycolization of air requires careful control of temperature, glycol concentration and humidity. So far the design of apparatus to control these factors is still on an empirical basis.

From these remarks it will be gathered that the present status of air sanitation is not sufficiently advanced to allow any positive recommendations to be made, although it is not denied that ultra-violet light and the glycol vapours may be effectively developed in the future.

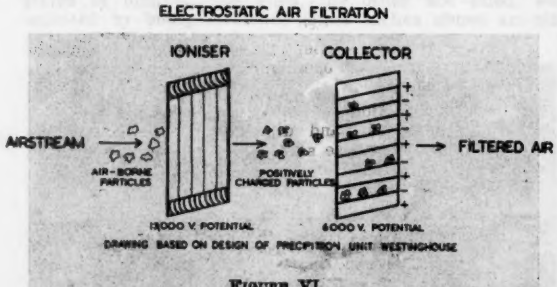

FIGURE VI.

Increasing the Resistance of the Host.

The subject of increasing the resistance of the host will be dealt with briefly and only from the point of view of reducing the incidence of hospital infection in a few isolated examples. As has already been suggested, we may consider the use of either chemoprophylaxis or immunoprophylaxis. The question arises, in what circumstances do we propose to use these adjuvants and to what extent?

To deal first with chemoprophylaxis. In recent years we have witnessed the discovery of antibacterial drugs capable of inhibiting the growth of bacteria *in vivo* without affecting the normal physiological function of the host cells. Therefore, the objections which many surgeons raise against the Listerian principle of applying antiseptics, on the grounds that these substances delay healing, has now been largely removed. For this reason I feel that the third principle of asepsis—namely, the destruction of bacteria—can be exploited to a fuller extent than is the practice today. For example, it may be suggested that all clean surgical wounds be treated with sterile antiseptic jelly containing one of the 5-aminoacridine derivatives or oxines. This suggestion must be regarded as suspect, coming from myself, but there is a method in my bias. In the first place, 5-aminoacridine is active *in vivo* against both Gram-positive and Gram-negative types, and it has a uniquely wide antibacterial spectrum (Rubbo, Albert and Maxwell, 1942). Secondly, in spite of numerous attempts, it has been found impossible to induce bacterial fastness against this substance. Thirdly, it is stable. Fourthly, it is non-staining. Fifthly, it does not induce drug allergy. Finally, it has a low tissue toxicity (Russell and Falconer, 1943). The oxine drugs have not been explored in recent years, but my personal opinion is that they may be used to a greater extent in the future. It may be argued that the sulphonamides or penicillin would be more appropriate alternatives. With this I strongly disagree, on the grounds that both these drugs are far more important chemotherapeutic agents and should be used only to suppress sepsis in contaminated and infected sites alone or in conjunction with aminoacridines. Their use in clean wounds in which contamination is minimal is unwarranted and may have serious repercussions in the development of sulphonamide-resistant or penicillin-resistant bacterial mutants. A recent paper by Barber (1947) supports this contention in respect of penicillin.

With regard to immunoprophylaxis, I may mention three circumstances arising in hospital in which this form of preventive therapy may be considered. It is now widely recognized that the incidence of pulmonary tuberculosis among nurses and students in general hospitals is higher than the incidence among other individuals of the same age group. It is my opinion that B.C.G. vaccination ought to be made available to those among this exposed group who fail to react to tuberculin. Recently, Wilson (1947) has questioned the value of B.C.G. vaccination, not on the grounds that it was ineffective, but because there are still insufficient statistical data to support it. I think one can assess B.C.G. vaccination today without waiting another five years for statistical evidence, by asking two questions. The first is: does B.C.G. vaccination convert a negative to a positive tuberculin response? The answer is yes in 90%

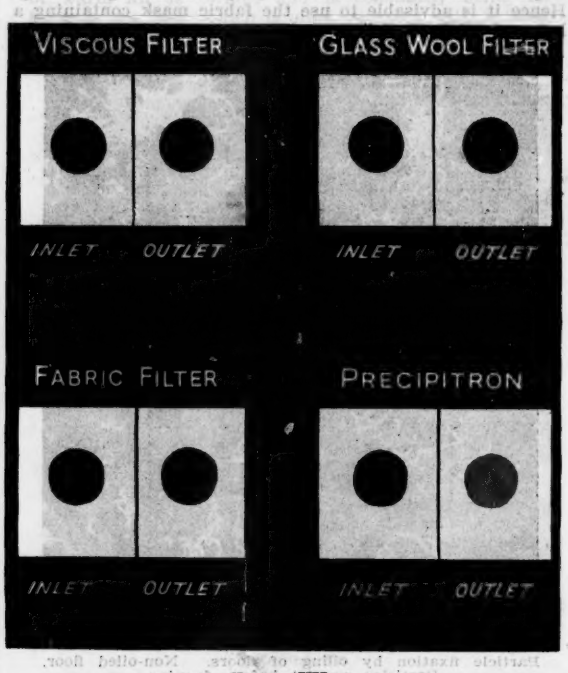

FIGURE VII.

of cases. The next question we must ask is: has the tuberculin reactor a higher degree of immunity than the tuberculin non-reactor? The answer is yes. Bracketing these two positive answers, we must conclude that B.C.G. vaccination does induce some degree of immunity against tuberculosis and for that reason should be used in selected groups, as I have indicated.

The second immunoprophylactic measure to which I wish to refer is the active diphtheria immunization of all children admitted to pædiatric hospitals who will remain in hospital more than six weeks and who are non-immune as determined by the Schick test. In a recent survey of rheumatic fever histories I was impressed by the number of sporadic cases of diphtheria developing during convalescence in hospital. It may be said that diphtheria is not a hospital problem and hence immunization could not benefit the hospital. This may be so, but it would undoubtedly render a service to the child within and without the hospital.

Finally we may refer to a non-specific measure of raising a patient's resistance—namely, by blood transfusion. Recently, Hill and Butler (1948), in a most interesting account of puerperal infection, concluded that 80% of these infections were due to endogenous and non-infectious anaerobic streptococci, whilst only 5% were due to exogenous and infectious *Streptococcus pyogenes*. This finding in itself is of extreme interest; but it was

also stressed that a predisposing condition to anaerobic streptococcal infection was a low blood hæmoglobin value. Hence it was deduced that an essential part in the care of the patient before and after confinement was to correct anæmia should it be present, as a prophylactic measure against an anaerobic streptococcal infection. A hæmoglobin level below 70% (Sahli) during the puerperium should be an indication for blood transfusion.

FIGURE VIII.

A violent sneeze. Over 40,000 particles are seen here. Reproduced from "Aerobiology", 1942, through the courtesy of the American Association for the Advancement of Science.

SUMMARY.

1. A comparison is drawn between problems of infection in hospital during the nineteenth and twentieth centuries.
2. Progress in surgery and obstetrics is shown to be due in part to the assimilation of the germ theory of disease.
3. The work of Lister and of Semmelweis on antiseptic treatment is briefly reviewed.
4. The importance of asepsis is stressed and the principles underlying this practice are defined.

FIGURE IX.

Enunciating the letter "f". Reproduced from "Aerobiology", 1942, through the courtesy of the American Association for the Advancement of Science.

5. The problem of infection in hospital today is illustrated by an analysis of post-operative wound infections in 253 cases of radical mastectomy and by a brief description of an outbreak in hospital of gastro-enteritis due to *Salmonella derby*.
6. The problem of control of infection in hospital is discussed under the following headings: the control of primary and secondary reservoirs of infection; the use of physical and mechanical barriers against spread of infection; the development of increased host resistance by chemoprophylaxis and immunoprophylaxis.
7. An indication is given of how detection of carriers should be incorporated into routine hospital practice.
8. A dressing technique applicable to surgical wards is described.
9. Oiling of floors and bedclothes is demonstrated as a most effective means of dust control.
10. The use of electrostatic air filtration and positive air pressure ventilation for dressing stations and operating theatres is recommended.
11. The importance of masking as a means of controlling droplet infection is stressed.
12. Other methods of droplet control, such as barrier nursing and the use of ultra-violet light and of aerosol vapours, are briefly discussed.
13. The use of mild antiseptics in dressing non-infected wounds at the time of operation is recommended as a prophylactic measure.
14. B.C.G. vaccination of nurses and students who fail to react to tuberculin and diphtheria immunization of susceptible children whose stay in hospital will be longer than six weeks are suggested.

FIGURE X.

Sneezing test of a dense all-fabric mask. Reproduced from "Aerobiology", 1942, through the courtesy of the American Association for the Advancement of Science.

15. Blood transfusion for puerperal patients suffering from anæmia (hæmoglobin value less than 70%) as a prophylaxis against anaerobic streptococcal infection is recommended.

ACKNOWLEDGEMENTS.

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Reviews.

THE BRITISH PHARMACOPŒIA, 1948.

THE seventh edition of "The British Pharmacopœia" is to hand and became official in Great Britain in September of this year.[1] The date for its adoption in Australia has not as yet been determined.

Though its compilation was well advanced at the outbreak of war in 1939, the difficulties and stringencies of that period made it advisable to amend the existing Pharmacopœia by successive addenda rather than to push on with a new edition. While these addenda necessarily reflected ephemeral adjustments and modifications, the outcome of wartime conditions, they kept pace in generous measure with the advances in therapeutics and ancillary sciences of preceding years.

Though in the list of deletions it is obvious that much has been done to separate custom-sanctioned chaff from therapeutically vigorous grain, a more enthusiastic sifting might have removed more without much loss. While some deletions have been actuated by economic considerations, where negative therapy is incompatible with the cost of production, many crude drugs and older galenicals have virtually deleted themselves by common consent, by changing fashion or by replacement with more useful substitutes. In the economy class are the distilled aromatic waters and most of the fresh infusions. In the second group are those malodorous relics of mid-Victorian capitalism, asafœtida and valerian; diuretic tortoises of the buchu, copaiba and santal oil group; plasters of lead, colophony, cantharidin and belladonna; confections of sulphur and of senna; some of the out-dated vitamin concentrates; and that time-honoured placebo, syrup of ferrous phosphate with quinine and strychnine. Wartime realities called attention to the waste involved in misusing cinchona and its galenical preparations as so called bitter tonics, so these are now relegated to outer darkness. Preparations of iron are reasonably reduced to four only—ferrous sulphate, iron and ammonium citrate, saccharted carbonate of iron and Blaud's pill—these in suitable doses being esteemed capable of catering for all iron deficiency requirements and for all moods and varieties of alimentary tract. Dilute acids are mainly discarded, the exceptions being those of hypophosphorus, phosphoric and hydrochloric acids, the last having its dose increased to 120 minims. Ammonium carbonate gives place to the more stable ammonium bicarbonate which will now be dispensed by official direction whenever "Ammon. Carb." is prescribed. The term "alcohol" without further specification now stands for alcohol 95% by volume, the former dehydrated alcohol being discarded.

Another group of deletions comprises many quite useful drugs which have been eclipsed by more useful, more dependable or safer modern equivalents. Among these are sulphapyridine and its soluble form for which but a short time ago the supply could not keep pace with the feverish demand. Though sulphadiazine is official, its promising methyl derivatives sulphamerazine and sulphamezathine have not been included, the only new drug of this group being succinylsulphathiazole. The introduction of the "sulpha" group, the penicillins and the mandelates has effected the dismissal of hexamine which over years has, with varying success, played antibacterial roles in renal, biliary and meningeal fields.

The introduction into the Seventh Addendum of strophanthin *G* having twice the toxicity of strophanthin *K* (designated officially as "strophanthin") presented many potentialities for error. This is now overcome by dismissing strophanthin and adopting the older name of ouabain for strophanthin *G*.

Chrysarobin is replaced by its simpler and less provocative equivalent, dithranol, while trinitrophenol (picric acid), still a favourite in many quarters, gives place to the acridines of which the practically neutral proflavine hemisulphate replaces the strongly acid proflavine sulphate. The increasingly popular aminacrine has been added, and the obsolescent acriflavine is retained. Amylocaine ("Stovaine") is retired in favour of amethocaine (tetracaine U.S.P.) and other local anæsthetics now included are butacaine and butyl aminobenzoate.

Despite the multiplicity of safe and versatile drugs of the barbiturate group which permits the deletion of carbromal and methylsulphonal, the phlegmatic sulphonal remains. Phemitone has been renamed methylphenobarbitone and phenytoin sodium ("Dilantin") is added as an anticonvulsant.

In its general form, the *British Pharmacopœia, 1948*, resembles the preceding edition and is sturdily bound and well printed. The monographs are set out with a clarity which exceeds that of previous editions and in many respects are reminiscent of the United States Pharmacopœia. Sections in each, dealing with general characters, solubilities, identification tests, assays, storage details and many others, meet the eye readily by introductory headings in heavier print, and each of the sections is plainly cross-indexed (where this is indicated) to relevant matter in the extensive appendices. Graphic formulæ are presented with many drugs, where these are known and generally accepted, and molecular constitutions are defined in accurate chemical nomenclature expressed in modern idiom.

On the subject of doses many improvements are seen. In former editions doses were quoted for all the crude drugs and for many others, even in cases where internal administration appeared to be out of step with current practice. The doses of practically all the crude drugs are now omitted as well as those of many liquid extracts—belladonna, colchicum, hamamelis, quillaia and others—where these are mainly used for the preparation of tinctures and other galenicals. While it is generally accepted that the official doses, unless otherwise specified, represent an average adult therapeutic range to be administered three or four times daily, the number of cases in which more exact specification is given is on the increase. Thus we see daily therapeutic and prophylactic doses quoted for the vitamins; with digoxin and others the initial dose is differentiated from the maintenance dose; with bromethol the dose is quoted in terms of milligrammes per kilogram or grains per pound; and in the case of desoxycortone acetate an implantation dose is given.

In consonance with current practice, the doses of the sulphonamides have been increased, but it is surely by oversight rather than by design that no dose is cited for sulphacetamide and its soluble derivative.

Several drugs of the *British Pharmacopœia, 1932*, appear with new names. Æther becomes *æther solvens* to distinguish it from *æther anæstheticus*, which for obvious reasons requires a higher standard of purification. *Aqua sterilisata* gives place to *aqua pro injectione* from which pyrogens are specifically excluded by appropriate directions for its preparation and by biological tests. Soluble forms of the barbiturates, sulphonamides, saccharin and fluorescein are now named as sodium derivatives, for example, *barbitonum sodium*, while liquors of adrenaline and of normal saline and liquid extract of pituitary are renamed and classed as injections. In the case of the posterior lobe of the pituitary three preparations are described: *injectio pituitarii posterioris* which carries all the active amines, pressor, oxytocic and antidiuretic, but is standardized in terms of oxytocic units, and *injectio oxytocini* and *injectio vasopres-*

[1] "The British Pharmacopœia, 1948", published under the direction of the General Council of Medical Education and Registration of the United Kingdom. London: Constable and Company, Limited. 9" × 6", pp. 954.

sini in which, by fractional separation, the appropriate amines are concentrated.

The total number of injections has been increased considerably and embraces a very wide range including æthanolamine oleate as a sclerosing agent, many alkaloids, singly and in combination, several soluble barbiturates and sulphonamides, vitamins, hormones, digoxin and ouabain as cardiotonic glycosides, penicillin in aqueous and oily bases, picrotoxin and other analeptics, and many recently included drugs such as neostigmine methylsulphate, sodium aurothiomalate, pethidine, histamine acid phosphate and heparin. Possibly the multiplicity of injections which include so many drugs commonly used in different doses and concentrations may appear redundant and perhaps even confusing, but it may have its place in any national scheme in which standard pharmacopœial formulæ are called for. In any case the specific directions for preparation, sterilization, storage *et cetera* have a practical educational value.

The range of formulæ for ointments and creams has been extended by the inclusion of certain newer bases. The introduction of wood alcohols (*alcoholium lanæ*) into the Sixth Addendum presented the first of the emulsifiable bases. This in the anhydrous preparation *unguementum alcoholium lanæ* is the official base for ointments of penicillin and salicylic acid. Mixed with an equal quantity of water it forms a water-in-oil cream known officially as *unguentum aquosum* or hydrous ointment. This is the vehicle for ointments of calomel, of ammoniated mercury and for the hydrous ointment of zinc oxide. An emulsifying base is now added under the title of *cera emulsificans* or emulsifying wax. This contains sodium lauryl sulphate as emulgent, incorporated in cetostearyl alcohol, and, in the form of certain proprietary equivalents, has been in use for some time as an ingredient of several oil-in-water creams. The official preparations of this are the anhydrous (hydrophilic) *unguentum emulsificans* and the emulsified form *unguentum emulsificans aquosum*. It is also used in the penicillin creams. These bases are perhaps too recently introduced to have acquired any stability of nomenclature, but it has been the practice in papers published in Australia to refer to all the hydrous preparations of these "emulsifiable" or "emulsifying" bases as oil-in-water or water-in-oil creams, rather than as ointments.

To the suppositories have been added those containing cocaine, bismuth subgallate, hamamelis, and hamamelis and zinc oxide. Though the suppository of lead and opium has been deleted, those of morphine and iodoform are rather surprisingly retained.

The number of antitoxins is increased and these are covered by an introductory monograph which sets out a general definition, methods of preparation and common specifications relating to their characters, potency, freedom from abnormal toxicity, sterility and requirements for labelling and storage.

The bacterial vaccines, to which have been added those for acne, cholera, dysentery, pertussis, plague and others, are similarly grouped in one descriptive monograph. The virus vaccine of yellow fever and the rickettsial vaccine of typhus are also introduced. Other agents for active immunization include diphtheria prophylactic (formol toxoid, alum-precipitated toxoid, and toxoid-antitoxin mixture and flocculeS) and staphylococcus and tetanus toxoids.

A very full range of sex hormones comprises the gonadotropes from human pregnancy urine (*gonadotropin chorionicum*) and from the serum of pregnant mares (*gonadotrophin sericum*); the steroid group of œstrogens and androgens—œstradiol, œstrone, testosterone and methyltestosterone; the non-steroid synthetic œstrogens—hexœstrol and dienœstrol; and progesterone and its orally administered derivative æthisterone.

Apart from the newer acridines other dyestuffs and their derivatives are included. Crystal violet (*viola crystallina*) and brilliant green (*viride nitens*) have staged a "comeback" following their popularity during the war, but though crystal violet has acquired a reputation as a vermicide no official dose for this purpose is quoted. A chemically related anthelmintic, diphenan, finds a place.

Within this review it would be impossible to comment on all the newer drugs, but of these should be mentioned the anticoagulants—heparin and dicoumarol; the alkaloids—colchicine, papaverine, and ergotamine; the cholinergics—neostigmine and carbachol; and the goitrogens—thiouracil and methylthiouracil.

Sterilization methods for parenteral injections have been revised and extended. The method of tyndallization has been deleted and where possible autoclave and filtration methods are advised. For thermolabile drugs, lower temperature heating with a bactericide is introduced, while for drugs unstable in aqueous solution instructions are given for dissolving the sterile drug in a sterile medium before use.

As in previous editions, the Commission deprecates the use of the symbols ℈i, used to represent 60 grains and also one fluid drachm, and ℥i to represent 480 grains as well as one fluid ounce. If the Imperial system must be used in prescribing it advises that solids be expressed in grains (gr.) and ounces (oz. = 437·5 grains) and liquids in minims (m.) and fluid ounces (fl. oz.). It further advocates the use of arabic rather than Roman numerals to express quantities.

Though each succeeding British Pharmacopœia becomes more complex as a meeting place for the application of progressively more of the cognate sciences, the Commission is to be congratulated on its production of a work of such clarity, definition and comprehensiveness.

MEDICINE FOR NURSES.

"AN INTRODUCTION TO MEDICINE FOR NURSES" by Patria Asher has been written, as stated in the preface, "to help nurses understand their medical cases", and in this regard it should certainly prove a valuable aid to all student nurses.[1] The fact that the book is comprised of some 400 pages is an adequate indication of the amount of subject matter contained in it, and throughout, each topic is dealt with clearly and concisely and with the correct amount of detail that is required in such a book. In addition to general medicine a valuable chapter is devoted to mental ill-health, a subject often omitted, unfortunately, from general text-books. Complete details of such practical procedures as lumbar puncture, artificial pneumothorax and blood transfusion are described, and due emphasis is placed upon teaching nurses the correct sites for intramuscular injections.

The only infectious fevers described are typhoid, dysentery, meningitis, infectious hepatitis, and glandular fever, and the author states that she has included only these as they are the fevers that may be expected to be met with in a general hospital. However, for the sake of completeness, it is to be hoped that in future editions this chapter will be greatly enlarged, for, in this country at least, all general-trained nurses are required to have a knowledge of all infectious diseases. There are numerous excellent diagrams and photographs throughout and a useful glossary is appended. This book can be recommended to all nurses and would prove useful also to tutor sisters and to doctors who lecture to nurses.

PSYCHOBIOLOGY.

THE second edition of Wendell Muncie's book "Psychobiology and Psychiatry" retains the form and framework of the first edition. Minor changes in the text have been made to bring the work more into keeping with the author's recent experience in private practice. The historical appendices of the first edition have been omitted because the author now considers that this material may be found in most medical libraries. A new chapter on physical methods of treatment has been added. This includes both types of shock treatment and prefrontal leucotomy, and serves to give a better balance to what purports to be a modern psychiatric text-book. Otherwise there are no gross changes, largely because there have occurred no momentous advances in psychiatric knowledge since the book was first published in 1939. Observation and experience proceed, and what has been gained thereby is gradually being incorporated into the general canon of psychiatry.

This is not a text-book for the beginner, though it should present no difficulty to the specialist. The book having taken its inspiration from the work and outlook of Adolf Meyer, its author introduced the Meyer terminology which, though useful and logical in some respects, has not yet been accepted by the general run of untrained Meyer psychiatrists. Who, for instance, would willingly forgo the simple and allusive word "hysteria" for such a phrase

[1] "An Introduction to Medicine for Nurses", by Patria Asher, M.D., M.R.C.P., with a chapter on Mental Ill-Health by Portia Holman, M.A., M.R.C.P., D.P.M.; 1948. London: William Heinemann (Medical Books), Limited. 8½" × 5½", pp. 424, with many illustrations.

[2] "Psychobiology and Psychiatry: A Textbook of Normal and Abnormal Human Behavior", by Wendell Muncie, M.D.; Second Edition; 1948. St. Louis: The C. V. Mosby Company. Melbourne: W. Ramsay (Surgical) Proprietary, Limited. 9½" × 6½", pp. 620, with illustrations. Price: 67s. 6d.

as "dissociative-dysmnesic substitutive reactions"? Again, "thymergasia" may possess the cultural distinction of classic roots, but the term "manic-depressive" has a more compelling connotation to English ears. These and similar terms may irritate the reader who meets them for the first time, but they should not spoil the general excellence of a work marked by clarity of exposition and wealth of psychiatric illustration.

Though the world experienced the cataclysm of war between the first writing of this book and the preparation of the present edition, no mention of wartime psychiatry may be found in its pages. This may appear surprising when one considers the magnified acceptance of psychiatry during the recent conflict; but, while problems arose which had a specific bearing upon war, nothing was discovered of any great psychiatric significance in those years, and the author no doubt prefers to give a clear statement of psychiatry and its practice rather than an exposition trammelled by a multitude of minor and transitory observations. Likewise, the subject of childhood psychiatry has been excluded on the good ground that it now occupies a field of its own. Reference is made to psycho-somatic problems in a limited manner, for this subject also appears to be occupying a field of its own. All in all, therefore, this text-book presents within reasonable limits an up-to-date account of modern psychiatry.

A GUIDE FOR STUDENTS OF MEDICINE.

IN "The Clinical Apprentice", a small manual of 192 pages, freely illustrated, the authors (John M. Naish and John Apley) set out to instruct the student beginning his clinical studies on the art of history taking and physical examination.[1] The general approach is excellent; the emphasis is on the patient as a whole, and not on the system under special consideration. The patient is a human being whose confidence must be gained at the first opportunity, the doctor something of a philosopher whose main task is to find "the real reason why he (the patient) came to see you". There is much wise and fatherly advice both on the doctor's approach to the patient and on the practical details of examination techniques, the whole being viewed as an art or craft rather than as an exact science. The diagrams on the whole are good and helpful, and the style is conversational and easy, with frequent flashes of humour, so that interest is always maintained. Sometimes the diagrams and descriptions are over-simplified, giving the impression of a shallow approach to the subject, in strong contrast to the general tone of the book. We feel, too, that for the student beginning his clinical studies there is not sufficient stress on the physical basis of many of the signs; for this reason the manual, by itself, is inadequate as a text-book on physical signs. However, there is so much wise practical advice and sound perspective that every fourth year student should read the book immediately after the introductory demonstrations on the methods of physical examination; in fact every student of medicine, be he old or young, would profit by its counsel.

THE DISCOVERER OF INSULIN.

A COMPREHENSIVE and precise account of the life and work of the discoverer of insulin has been given by Dr. Lloyd Stevenson in his book "Sir Frederick Banting".[2] The author, who is a young Canadian physician, has taken infinite pains to do ample justice to his interesting subject and he has left no stone unturned to ensure that all sources of information are completely reliable. His facts have been gleaned from a number of people who were in close association with the scientist at some time or other during the varied stages of his remarkable career; they have been extracted from his own laboratory notes, from his private diaries and from many official records relating to his military and academic activities.

The theme dominating the story is the positive way in which Banting's work served to impress upon the whole world that medicine as a science now had something definite to give in respect of a discovery that could bring renewed hope and immediate relief to suffering humanity. That the elusive extract from the islets of Langerhans could bring added benefit to humanity in an indirect way was instanced in the case of Dr. George B. Minot, whose failing health might have prevented his pursuing investigations on the administration of liver extract in cases of severe anæmia, had it not been possible for his own disordered sugar metabolism to be adequately controlled at a critical juncture by the newly discovered "isletin".

From the pages of this substantial book, besides gaining a beneficial insight into everyday life in our sister dominion, the reader will derive enjoyment from the elegant style of the writing and from the lucid manner in which the whole story is told. Beginning with Banting's early exploits on a small farm near the township of Alliston in the province of Ontario, and his years of study at the University of Toronto in order to satisfy a long ambition to become a useful medical practitioner, the real action commences with his eager departure for the battlefields of France, where, as a medical officer of the Royal Canadian Medical Corps, his courage, endurance and efficiency were rewarded with a military decoration. He was wounded in action and evacuated to England, so that the opportunity soon offered for a post-graduate course that would help him to fulfil a further ambition to become a competent orthopædic surgeon. On his return to Canada he ventured upon a specialist practice at London, Ontario, where he waited somewhat restlessly for patients to turn up. Fortunately, this enforced idleness led him readily into academic paths at the medical school, and here he conceived the notion to seek enlightenment on the unsolved mystery connected with the internal secretion of the pancreatic gland.

In the succeeding chapters there is a clear account, step by step, of the research work undertaken by Banting in the laboratory of Professor Macleod in Toronto, where he began his self-imposed task with the enthusiastic assistance of C. H. Best, a student member of the senior class in physiology at the medical school. The scientific exposition of happenings during these crucial months of experimentation which ended in the discovery of the active principle from the islets and in a full realization of its remarkable effects in hopeless diabetic cases, is all handled by the author in an extremely masterful, clear and succinct manner.

Subsequent chapters have much to relate of the peculiar reactions of the young scientist to his sudden accession to world fame, of the acquired ability to lead others in medical research by stimulating interest and ready cooperation in any course of action he wished to pursue. Here it is interesting to read of the lighter side of Banting's strenuous scientific activities, of the irrepressible impulses to express himself through the art of landscape painting, of his frequent escapes from the realities of laboratory routine in the pleasant company of fellow artists, and of his ardent desires to explore the hinterland of his own country or to set out on more travels throughout the wide world. The final chapters tell of his important work in aviation medicine during the last world war and of the tragic circumstances which terminated a colourful and distinguished career.

The author has given many documentary references for all statements in the text and has illustrated his book with a number of clear plates from photographs and drawings, which help to make it one of the outstanding biographies of recent years. Any scientific medical practitioner or research student cannot fail to find help and encouragement in the essentially human story that lies behind this great advance in the progress of medicine.

Books Received.

[The mention of a book in this column does not imply that no review will appear in a subsequent issue.]

"Modern Treatment Year Book, 1948: A Year Book of Diagnosis and Treatment for the General Practitioner", edited by Sir Cecil Wakeley, K.B.E., C.B., D.Sc., F.R.C.S., F.R.S.E., F.A.C.S., F.R.A.C.S. (Hon.); 1948. London: The Medical Press. 8¾" × 5½", pp. 380, with illustrations. Price: 15s.

A series of articles by selected authors.

"The Better Utilization of Milk", by R. C. Hutchinson, B.Sc. (Tasmania), D.Sc. (Melbourne), F.A.C.I.; 1948. London and Sydney: Angus and Robertson. 8¾" × 5½", pp. 234. Price: 25s.

Intended to show how milk can be used to the best possible advantage and with a minimum of waste.

[1] "The Clinical Apprentice: A Guide for Students of Medicine", by John M. Naish, M.D. (Cantab.), M.R.C.P., and John Apley, M.D. (Lond.), M.R.C.P., with a foreword by Professor J. A. Ryle; 1948. Bristol: John Wright and Sons, Limited. 7½" × 4½", pp. 214, with illustrations. Price: 15s.

[2] "Sir Frederick Banting", by Lloyd Stevenson, M.D.; 1947. London: William Heinemann (Medical Books), Limited. 9" × 6¼", pp. 466, with illustrations. Price: 25s.

The Medical Journal of Australia

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All articles submitted for publication in this journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

References to articles and books should be carefully checked. In a reference the following information should be given without abbreviation: initials of author, surname of author, full title of article, name of journal, volume, full date (month, day and year), number of the first page of the article. If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given with full date in each instance.

Authors who are not accustomed to preparing drawings or photographic prints for reproduction are invited to seek the advice of the Editor.

CARBON MONOXIDE AND CIVILIZATION.

SOMEONE has said that if the red-blooded vertebrate had been subjected, from the time of its emergence from the ancestral and as yet unknown invertebrate, to the danger of carbon monoxide poisoning, it would have developed a protective perception and instinct and this gas might well have acquired in the course of evolution a repulsive odour. Exposure to the products of incomplete combustion had certainly been present before the appearance of *Homo sapiens*, but only on those rare occasions when fires had been started by lightning or volcanic eruption. When, however, inventive man came upon the scene, then the incidence became greatly enlarged, and this accompaniment of human ingenuity has gone on increasing. Today we may assert with some assurance that the number of fires produced by non-human agency is so small as to be negligible. Long before the Germans resorted to poison gas in 1915, smoke had been employed in warfare to suffocate enemy forces or to make them panic into flight or surrender. Sir Walter Raleigh, in the chapter of his history of the world entitled "How Alexander Fell into the Persian Luxuries", gives several instances of the use of smoke in war, one being directly under his observation. Of course, in smoke there are ingredients more potent than carbon monoxide in that they are irritating and irrespirable which carbon monoxide is not; still this gas plays a considerable part in the unconsciousness and death resulting from incomplete combustion of carbon-containing material. When coal-mining ceased to be a matter of open cuts or shallow excavations on slopes, then carbon monoxide in the form of the lethal "choke damp" made its appearance. A charcoal brazier in an unventilated room was known to be deadly, and human derelicts seeking the warmth of a lime-kiln at night have fallen into a sleep from which there was no awaki ing. The invention of coal gas by Murdock led to a great increase of carbon monoxide poisoning, not so much through the presence of this substance in the gaseous products of heating coal in retorts as through contamination of the air by burning as an illuminant. The present generation, accustomed to electric light, has no conception of the evil effects of concert hall, theatre and church lit by gas. From these buildings the audiences went home at night with flushed faces, throbbing temples, excited heart action and general discomfort often inviting the temporary relief given by alcohol. The many evening readings given by Charles Dickens, though lucrative, undoubtedly hastened his death. No sooner had illumination by gas been displaced by electricity than another culprit arose, namely, the internal combustion engine which throws out in its exhaust quantities of carbon monoxide. Australian civic authorities were not thinking of carbon monoxide when they wisely, as it turned out, limited the heights of buildings and so permitted abundant sunshine and pure air to be available to the citizens. The American city with its streets of concrete canyons needs wind velocities of almost gale magnitude to ensure purity of air. Australian visitors to New York City soon become aware of smarting eyes and subsequent headaches which the extensive use of petrol-driven vehicles produces.

On top of the vitiation of our goodly atmosphere from the internal combustion engine comes that from the modern vogue of smoking, which has its votaries now in both sexes and all ages above puberty, an indulgence only restrained by the hours of sleep. The American investigators Roughton, Darling and Root announced that during the course of the day as much as 2·0 volumes *per centum* of carbon monoxide may be found in the blood of smokers.[1] This has been confirmed by the Oxford researchers, Courtice and Simmonds, in a purely physiological inquiry with little clinical interest.[2] They find that the method of smoking rather than the quantity of tobacco consumed influences the absorption of this gas: "a heavy smoker may have a low CO content while a light smoker may have a high content during the course of the day". One of their interesting discoveries is that the blood of non-smokers in Oxford contains small quantities of carbon monoxide up to 0·2 volume *per centum*; this they attribute to the internal combustion engine. If this can occur in the sequestered and uncommercialized precincts of Oxford, what must be the total in a great city with heavy traffic, narrow streets and high buildings? So far the concentrations of carboxyhæmoglobin can hardly be regarded as reducing human efficiency to any appreciable degree; but the tendency is for this atmospheric contamination to increase, and who knows what the future may bring forth, especially when every home has its helicopter and jet-propelled plane?

A BRITISH COMMONWEALTH MEDICAL CONFERENCE.

ON September 15 and 16, 1948, a meeting was held at British Medical Association House, Tavistock Square, London, in order to consider the desirability of developing closer personal and professional relations among the national medical associations of the British Commonwealth and the methods by which this could be done. Representatives of the national medical associations of the following units of the Commonwealth were present: Australia,

[1] *The American Journal of Physiology*, Volume CXLII, 1944, page 708.
[2] *Journal of Physiology*, Volume CVII, 1948, page 300.

Canada, Ceylon, Eire, Great Britain, India, New Zealand, Pakistan, South Africa and Southern Rhodesia. A full and informal discussion took place and it was resolved first of all that it was desirable to develop closer personal and professional relations through their national medical associations or units between the nations linked in the Commonwealth. A series of resolutions were adopted and these will be sent to the national associations or units for their approval. If approval is given, a conference of representatives of national medical associations or units will be held once a year. It was resolved that whenever possible the conference should be held in conjunction with a general meeting of the host association or unit, that the conference would normally last for three days, and that each country should be invited to send two representatives to each conference. The secretary of the host association or unit will be the secretary of the conference and will be responsible for convening the meeting, for the preparation of the agenda and for executive action resulting from decisions made. Suggestions for the agenda will be invited and the agenda will be issued to associations at least two months before the meeting.

Those present at the London meeting had no doubt about the acceptance of the proposals by the constituent associations or units—and in this they were probably right—because they decided that, subject to confirmation, the invitation of the Canadian Medical Association to hold the first conference of representatives at Saskatoon, Canada, on June 7, 8 and 9, 1949, should be accepted. Dr. J. F. C. Anderson, the president-elect of the Canadian Medical Association, will be the president of the first conference. It was also decided provisionally that the conference for 1950 should be held at Brisbane and the conference for 1951 at Johannesburg. The next session of the Australasian Medical Congress (British Medical Association) is to be held at Brisbane in 1950, and the British Medical Association will hold its annual meeting for 1951 at Johannesburg.

Whether this proposal for an annual conference is looked at from the point of view of medicine within the British Commonwealth or from the larger viewpoint of the Commonwealth as a whole, the idea has much to commend it to the members of the medical profession, *inter alia* as a means of creating new friendships and cementing old ones and so of bringing about closer union among the component nations, and also as a sign, however small, to the whole world that there are within the several units of the Commonwealth groups of persons with scientific training and a knowledge of humanity to whom tradition and cohesion are indispensable.

Current Comment.

REACTIONS OF THE VULVA TO SYSTEMIC DISEASE.

THE skin of the vulva represents an area of body surface which readily responds to many internal diseases. As John Parks and Shirley Martin point out,[1] this tissue is comparable with the breasts and lips, but has an added importance in its proximity to the organs of excretion and its exposure to frequent trauma, contamination, warmth and moisture — factors which tend to decrease skin resistance to systemic disease. The blood dyscrasias—agranulocytosis, aplastic anæmia and acute leuchæmia—cause peripheral vascular changes which result in deep, punched-out, oval ulcers with a thin greyish membrane and very little induration or redness. Pernicious anæmia is a deficiency disease which gives rise to tissue devitalization. In a case described by these authors, areas of ulceration were found in the bladder mucosa, tongue and mouth, as well as on the vulva. In uræmia there is a superficial excoriative type of ulceration, with a thin greyish membrane and surrounded by crystals of urea and uric acid. Vulval ulceration in diabetes is due to disturbances in cellular nutrition caused by inadequate metabolism of fats and carbohydrates, the exhaustion of supplies of nicotinic acid and riboflavin and the presence of sugar in the urine which acts as a culture medium and keeps the vulva moist. Lack of vitamin *B* factors is the most common deficiency influencing the skin of the vulva; this is often camouflaged by secondary infections, lack of riboflavin favouring Monilia infections, and Vincent's organisms often being present in ulcers due to pellagra. Parks and Martin point out that when either of these infections is found in patients with pregnancy, diabetes, alcoholism, hyperthyreoidism, fever or any debilitating condition, vitamin *B* deficiency must be considered as a predisposing factor. Vitamin *B* factors are essential for cellular nutrition and respiration and, as neurons are the most sensitive cells, this may account for the early appearance of hypersensitivity and itching. As the metabolism of œstrogens increases the demand for vitamin *B*, œstrogens given to a patient with a subclinical deficiency may cause the appearance of the characteristic lesion. Allergic dermatitis first appears as œdema of the vulva and itching with subsequent trauma. The more common sensitizing agents are phenolphthalein, impure soaps, rectal ointments, phenol-containing douching materials and underclothing. Poorly processed rayon and garments with incompletely fixed dyes are common causes of vulvitis. The skin of the vulva is a small enough section of the anatomical area which the gynæcologist regards as his special field, but this discussion by Parks and Martin provides sufficient grounds by itself for insistence that the gynæcologist should be first and always a competent physician.

[1] *American Journal of Obstetrics and Gynecology*, January, 1948.

POSTURAL PROTEINURIA.

IT might be thought that there was not much more to be said on the subject of the harmless proteinuria not infrequently seen in healthy persons, who are usually young. General opinion of the significance of proteinuria has swung from one extreme to another over a generation or so, but now may be considered to be fairly stabilized. Yet there are still those who deny the existence of a completely benign leaking of protein from the kidney, and those who take little notice of the presence of demonstrable protein in the urine. G. M. Bull has made a painstaking study designed to settle the question of the mechanism at work.[1] A bibliography of seventy references only taps a part of the flood of writing on this subject, but it will perhaps be found surprising that benign proteinuria was described over a hundred years ago. For a long time it has been known that posture is a factor, as the old name "orthostatic albuminuria" shows, and the importance of lordosis has often been pointed out in the older literature. Bull states that the hypotheses which have gained some credence include a suggestion that there is some abnormality of the blood, that there is some congenital or acquired lesion of the secreting mechanism of the kidney, or some instability of the vasomotor arrangements in it, and that there may be a disturbance of the venous return from the kidney. His investigation was made on a series of healthy sea cadets and a number of patients over the age of fifty years who had no renal disease. Some young men found to have proteinuria on examination for military service were also examined. The

[1] *Clinical Science*, Volume VII, 1948, Number 1.

tests used included examination of the urine for protein by a turbidometric method, estimation of the total and fractional amounts of serum proteins, estimations of blood urea and creatinine contents, a number of clearance tests, the cold pressor test and an Addis count of cells in the urine. The effect of posture in producing proteinuria was studied, use being made of the ordinary uncontrolled posture, induced lordosis both in the erect and recumbent positions, erect and recumbent kyphosis, and a lordotic posture with and without an abdominal binder. Proteinuria was found in association with lordosis, being maximal in the erect position, and could be lessened or abolished by the application of a tight binder. It did not occur with the kyphotic posture. No relation with vasomotor states could be found, nor with type of general build. The question of a possible relation to previous infection has, of course, been studied before also, but Bull could find no evidence of this, or of renal disease in following a group of the youths he studied. It will be recalled that in the past investigations have been made into the occurrence of proteinuria in young persons who have recently had an attack of tonsillitis, but this aspect of the relation of nephritis to infection of the upper respiratory tract is quite a different matter. Microscopic and functional tests revealed no significant connexion between the type of proteinuria under review and renal disease. One interesting finding was made on examining the foot-tongue circulation times; in the proteinuric group these times were considerably greater in a position of recumbent lordosis than in that of recumbent kyphosis, whereas in the control groups no such difference was found. In further investigation of this the pressures in the inferior *vena cava* were measured directly by the catheter technique, with the result that a rise in pressure accompanying change in posture from erect kyphosis to erect lordosis was found to be signficantly greater in the proteinuric subjects than in others. Anatomical studies on cadavers demonstrated a considerable degree of variation in the relationship of the liver to the upper part of the inferior *vena cava*, thus introducing a variable factor in the amount of compression which change in posture would cause in this vessel. Further study of some of the subjects showed that, when recumbent lordosis was combined with an inferior rotation of the liver produced by pressure, varying degrees of proteinuria could be demonstrated. Bull discusses fully the different hypotheses in the light of these experiments, and concludes that the current ideas are insufficient to explain postural proteinuria. He suggests that the mechanism is as follows: a rise of pressure in the inferior *vena cava* is caused by compression of the posterior surface of the liver against the spine, which in turn sets up passive congestion in the kidney and thus proteinuria. Lordosis favours the production of this pressure. It seems as if a good case has been presented for posture and passive congestion of the renal circulation as the cause of this condition.

WHITE BREAD VERSUS BROWN.

WHATEVER opposing views were taken by nutritional experts on the relative food values of whole meal and white flour bread, and these were often expressed with a vehemence not quite in the tradition of scientific debate, there was one established fact which could not be challenged. This was that the more wheat pericarp is contained in the flour, the greater is the amount of nitrogen in the fæces. The theory of this, accepted for a long time, was, firstly, that bran proteins are refractory in digestion and, secondly, that fibre acts as an irritant, a mild purgative in fact, and so the digesting mass is sent through the alimentary canal too quickly for effective absorption. Moran and Pace in 1942 announced that every increase in fibre of 0·2% over a basal figure of about 0·15% leads to a decrease in digestibility of about 1·1%. Satisfying as this theory might have appeared, it was destined to be successfully challenged. The first assumption to be disproved was that bran protein is difficult of digestion. Borgström in 1941 showed that this protein is extensively digested *in vitro* and this result has since been confirmed by others.[1] The second moiety of the hypothesis, namely, that the increased nitrogen in the fæces after the eating of high extraction flour is due to decreased absorption, was the next to go. R. A. McCance and E. M. Widdowson, in 1947, experimenting with whole meals of different nitrogen content, proved conclusively that the amount of nitrogen in the fæces is independent of the nitrogen in the food and is to be explained as a constituent of intestinal secretion.[2] They also concluded that the protein of 90% extraction wheat meals is completely digested. R. A. McCance and C. M. Walsham have recently attacked this same problem and have come to the same conclusion, that is to say, the proteins of whole wheat bread are completely or almost completely digested and absorbed, whilst the nitrogen in the fæces is entirely due to bowel secretion.[3] This, of course, does not alter the fact that the net gain in nitrogen is greater with white flour than with brown. These authors give amended figures for the factors to be used in assessing calorie values from the content of protein, fat and carbohydrate, namely, multiplying by 3·65 and 3·21 for the proteins of Canadian and English wheat respectively, and by 5·5 for fat and 4·2 for available carbohydrate.

McCance and Walsham confirm absolutely the earlier view that whole meal leads to an adverse calcium balance, and indeed one of the experimentees had a severe attack of tetany as a result of the phytic acid poisoning. It will be remembered that during the last war the British authorities recommended seven ounces of carbonate of lime to be added to each bag of 85% extraction flour. That in Dublin an outbreak of rickets occurred at the same time as a 100% extraction flour was used in baking is significant in this connexion.

Another problem investigated was that of the purines of whole wheat flour. Von Fellenberg in 1918 demonstrated that 100% extraction meal contains between four and five times as much purine as white flour.[4] McCance and Walsham now make it clear that the uric acid output varies with the wheat purine intake and represents 55% to 60% of this. No doubt the violence of opinion regarding the dangers of uric acid has more or less spent itself, though a few medical men of an older school cling to the cult; still this rise of uric acid following whole meal ingestion is of interest.

SYPHILIS IN TUBERCULOSIS PATIENTS.

THAT syphilis can be superimposed on tuberculosis is unfortunately only too true, and instances of this dread alliance are not unknown in literary history. In a brochure emanating from the Tuberculosis Clinic at Santa Cruz and the Sanatorium at Ofra, both in Tenerife, Dr. Tomás Cerviá in collaboration with Dr. V. Gutiérrez discusses the frequency of this dual incidence.[5] Some 5·4% of their tuberculosis patients were unmistakably syphilitic, whilst 6·2% gave partial or transitory positive responses to serological tests. Amongst their conclusions are the following. Syphilis affects the tubercular process very little; differential diagnosis between the two in respiratory disease is sometimes difficult; anti-syphilitic treatment must be carried out cautiously in tuberculous patients. The authors advise giving bismuth if the phthisis is far advanced and then carefully passing on to the arsenicals. They recommend that in all examinations for tuberculosis, serological tests for syphilis should be carried out as a routine measure. The article contains an interesting table giving the percentage of syphilis in tuberculous patients as published by some 51 authors in different countries. The figures vary from 1% to 30%, the latter obviously indicating very special conditions. Doubtless this double infection is more common in Tenerife than in Australia, but its possible occurrence should be borne in mind.

[1] *Acta physiologica Scandinavica*, Volume II, 1941, Supplement 7.
[2] *Journal of Hygiene*, Volume XLV, 1947, page 59.
[3] *British Journal of Nutrition*, Volume II, 1948, page 26.
[4] *Biochemisches Zeitschrift*, Volume LXXXVIII, 1918, page 323.
[5] *Trabajos del Dispensario Antituberculoso Central y del Sanatorio Antituberculoso de Ofra*, Santa Cruz, Tenerife, Volume VIII, 1948, page 54.

Abstracts from Medical Literature.

SURGERY.

New Donor Areas in Skin Grafting.

DONALD EARL BARKER (*Annals of Surgery*, March, 1948) presents a method whereby irregular skin areas may be utilized as donor areas by using a dermatome or by cutting the graft free-hand. He points out that at times the thighs, abdomen and back in thin individuals and the chest in an obese individual are the areas from which adequate grafts may be taken. However, on occasions, patients are seen in whom these donor areas have been destroyed by burns. Grafts can be taken from practically all irregular areas if saline solution is injected beneath the skin, causing obliteration of the depressions. A 30-millilitre syringe and a long needle are used.

Epidural Anæsthesia in Thoracic Surgery.

Y. F. FUJIKAWA *et alii* (*The Journal of Thoracic Surgery*, February, 1948) discuss the history, physiology and technique of administration of epidural anæsthesia and report its use in over three hundred thoracic operations. The results are analysed for a series of one hundred of the operations which were performed on 66 patients at the Missouri State Sanatorium. Comparison is made of the various types of anæsthesia at present in use for thoracic operations with epidural anæsthesia. The advantages and disadvantages of epidural anæsthesia are presented, and it is stated that it most closely approaches the ideal anæsthesia for chest surgery. The chief disadvantages are that it requires a somewhat difficult technique and the fact that at least thirty minutes must elapse after the administration of the drugs (a mixture of procaine, butethanol and adrenaline) before the operation can be commenced.

War Wounds of the Rectum and Anal Sphincter.

WILLIAM S. MCCUNE (*Surgery*, April, 1948) gives an account of the classification, methods of treatment and results obtained in a group of patients at the Walter Reed General Hospital while it was a centre for treatment of wounds involving the rectum and anal sphincter; during World War II forty-one patients between the ages of twenty and thirty-six years were treated. Each patient on admission was classified after careful examination and proctoscopy, then placed on sphincter and gluteal muscle exercises and reexamined weekly for four weeks before any operative treatment was carried out. Some eleven patients gained sphincter control with this means alone, no operation being necessary. The classification of the conditions of the other thirty patients was into five groups: (i) high rectal fistulæ not involving the anal sphincter; (ii) wounds of the anal sphincter in which part of the muscle was replaced by scar, but the remainder functioned satisfactorily; (iii) complete destruction of the sphincter, but with good perianal tissue and good gluteal function, this group including injuries of the nerve supply of the sphincter; (iv) complete destruction of the sphincter with additional loss of perianal tissue; (v) complete loss of the sphincter, lower rectal and perianal tissue and gluteal muscle with extensive scar formation. As operative routine all patients were given sulphasuxidine five grammes every eight hours by mouth and two grammes daily into the lower loop of the colostomy for five days before operation. High rectal fistulæ were treated by thorough curettement of granulation tissue and removal of sequestrated bone from the coccyx and sacrum or by thorough excision of the fistula with closure of the bowel by double-layered suture and then mobilization of well-vascularized flaps of muscle and subcutaneous tissue to meet in the mid-line and close the dead space. When there was destruction of part of the sphincter a circular incision was made at the muco-cutaneous junction and the mucosa was stripped up to a point well above the scarred area; the scar tissue was excised from the sphincter, skin and mucous membrane; the ends of the sphincter were carefully dissected out to allow them to be crossed over, sutured together and anchored to perianal tissue, and the mucous membrane was drawn down and sutured to the skin. Complete sphincter loss with good perianal tissue was treated by the Stone fascial plastic operation. For complete sphincter loss with damage to perirectal tissue preliminary plastic operation was required before the Stone fascial plastic operation was applied to the sphincter area. In the presence of complete sphincter loss with extensive scarring and loss of gluteal function no satisfactory sphincter repair could be performed and colostomy was permanent.

Surgical Treatment of Cardiospasm.

E. B. KAY (*Annals of Surgery*, January, 1948) presents the surgical technique employed and the results obtained in the treatment of seventeen patients suffering from cardiospasm whose condition had not been improved by instrumental dilatation. All cardioplasties were performed through a transpleural approach; the cardioplasties in the first three cases were performed in a manner similar to the Finney pyloroplasty technique, the others in a manner similar to a Heincke-Mikulicz pyloroplasty technique. In each patient there was great reduction in the size of the œsophagus post-operatively and all patients experienced great relief of symptoms, being able to note the sensation of food and fluids going immediately into the stomach on swallowing, a sensation they had not experienced for many years.

Sympathectomy and Hypertension.

THOMAS FINDLEY (*Surgery*, April, 1948) points out that as yet the operation of sympathectomy for hypertension has not been placed on a rational basis, that it seldom, if ever, produces manometric cure, that it is often followed by spectacular amelioration of symptoms, that the results are apt to be temporary, and that finally the treatment is violent. In the opinion of the author the following points should be considered in the selection of patients for sympathectomy. (i) Little reliance can be placed upon prediction tests which measure the response of blood pressure to sedation or anæsthetization of the nervous system. (ii) The operation should be reserved for those with severe symptoms, but no gross impairment of cerebral, cardiac or renal function. (iii) The operation should not be performed on young individuals with mild asymptomatic hypertension because of the possibility of nerve regeneration. (iv) Sympathectomy may profitably be carried out on patients over fifty years of age, provided other requirements are met. (v) Patients should be told that sympathectomy offers palliation and not cure.

Gangrene of Both Legs following Femoral Vein Ligation.

JACOB SARNOFF (*New York State Journal of Medicine*, July, 1948) discusses some of the indications for femoral vein ligation and reports a case in which this procedure was carried out on a patient, a male, aged fifty years, as a prophylactic measure to prevent possible pulmonary emboli. Immediately after ligation both legs became cyanotic and in the course of the next few days gangrenous. Subsequent amputation of both legs below the knee became necessary.

Hyaluronidase and Urinary Calculi.

L. NARINS, NORMAN SIMON AND G. D. OPPENHEIMER (*Journal of the Mount Sinai Hospital*, May-June, 1948) outline their observations of the effect of an enzyme, hyaluronidase, on eight urinary calculi. They state that since urinary calculi are composed of a mineral component and a colloid matrix and since the attempts to dissolve the mineral constituents have met with only limited success, the need for a colloid solvent is obvious. The colloid matrix is considered from analysis to consist of a series of complex chemical substances, chief among which are nucleic acid, mucin, glycogen, chondroitin sulphate and a complex polysaccharide containing nitrogen. This last substance may be related to hyaluronic acid, and therefore hyaluronidase was used in an endeavour to dissolve this constituent of the colloid matrix. In five out of eight urinary calculi so treated fragmentation was noticed; whether this was a specific effect of hyaluronidase or due to other factors was not definitely determined.

Pulmonary Resection for Abscess of the Lung.

R. P. GLOVER AND O. T. CLAGETT (*Surgery, Gynecology and Obstetrics*, April, 1948) discuss 37 patients who had lung abscess in various stages of chronicity and who underwent pulmonary resection. Two underwent partial resection, sixteen lobectomy, three bilobectomy and sixteen pneumonectomy. Of those undergoing partial resection and lobectomy all were cured, while of those requiring bilobectomy two-thirds were cured (one-third died), and of those needing pneumonectomy just over one-third died. The discrepancy in the results between the two groups is obvious and cannot be explained on the basis of the magnitude of operative procedure alone, but is influenced greatly by the fact that individuals in whom the whole lung has been destroyed by suppuration have been subjected to a long period of toxicity and debility and will in consequence be in a much worse pre-operative condition and will undergo extensive manipulation with greater risk. The authors make a plea for surgical consultation in cases of lung abscess at the outset in order that the optimal time for operation may not be

overlooked. Under these circumstances the relationship between drainage and resection will in time become clear. Resection will supplant drainage as long as lung abscesses are presented to the surgeon in the chronic or complicated stage. If the patients are seen early and the lesion is found to be localized without evidence of widespread secondary changes (fibrosis, bronchiectasis, bronchostenosis, atelectasis) open drainage is the reasonable procedure. The authors list the following indications for pulmonary resection in cases of lung abscess: (i) persistent symptoms due to pathological changes secondary to open drainage, (ii) multiple or multilocular abscesses, (iii) abscesses associated with secondary changes such as fibrosis, bronchiectasis, bronchostenosis or atelectasis, (iv) abscesses so located anatomically as to be inaccessible to adequate drainage, (v) abscesses in which diagnosis of malignancy is entertained, (vi) abscesses associated from the onset with excessive bleeding, (vii) abscesses in children, (viii) abscesses secondary to foreign bodies not removable by bronchoscopic methods.

Carcinoma of the Breast.

A. S. JACKSON (*Annals of Surgery*, January, 1948) reports the case histories of three patients, all of whom had a similar history of a lump in the axilla and in all of whom clinical examination failed to reveal any breast lesion. Excision of axillary nodes and pathological examination of the specimen were performed. In one patient carcinoma of the breast occurred almost three years later, whilst on the basis of the histopathological report the other two patients were submitted to radical mastectomy and examination of the breast revealed a carcinoma.

Vagotomy.

I. F. STEIN, JUNIOR, AND K. A. MEYER (*Surgery, Gynecology and Obstetrics*, April, 1948) describe the insulin test of vagus action on the stomach in relation to vagotomy for peptic ulcer. Their method consists basically of the intravenous injection of 14 to 16 units of regular insulin into a patient in a basal resting phase at least twelve hours after a meal; then by the use of an indwelling Levine tube and a tube with a rubber balloon attached they study the acidity of the stomach by aspiration of the stomach contents and the motility by tracings made on a slowly moving kymograph. The acid response of patients with duodenal ulcer in the pre-operative tests showed an increase in free acid commencing at the height of the hypoglycæmia. In the post-operative state, some ten days to two weeks after operation, 18 of 22 patients showed no acid response to insulin hypoglycæmia. These were considered to have complete vagotomy. In three patients there was pronounced acid response; these were considered to have had incomplete vagotomy. Studies of mobility indicated similarly the efficiency of vagotomy. The authors consider that the presence of acid response to insulin hypoglycæmia and of spontaneous or insulin-induced hunger contractions in the fundus of the stomach is proof positive of incomplete vagotomy and that the absence of acid response to insulin hypoglycæmia and of spontaneous or insulin-induced hunger contraction in the fundus of the stomach may be indicative of complete vagotomy. However, here the following factors must be considered. There must be sufficient hypoglycæmia to produce central stimulation of the vagus and the hypoglycæmia must not be too profound or there may be no vagal stimulation.

Anterior or Perineal Pilonidal Cysts.

T. E. SMITH (*The Journal of the American Medical Association*, April 10, 1948) discusses the occurrence of pilonidal cysts in the perineum several inches anterior to the anal verge and illustrates the discussion with reports of four such lesions seen by him in a two-year period. The problem of diagnosis is difficult and in all four cases the patient had been referred as suffering from "anterior anal fistulæ". Bacteriological study of the exudate from the fistula was found to be of importance in the differential diagnosis, for coliform bacilli were not found in any of the cases of perineal pilonidal cysts, while they were universally found in the exudate from the external orifices of anal fistulæ. Methylene blue instilled into the external orifices of the perineal pilonidal cysts did not appear in the anal canal and radio-opaque oil instilled was seen in the subsequent X-ray film pooling in the perineum with no tract leading towards the anal canal. Operative removal was performed *en bloc* and hair was found in the cavity which was shown microscopically to have the same structure as seen in coccygeal pilonidal cysts. The possible ætiological explanations are discussed in brief.

Surgery of the Lower Part of the Bowel.

H. E. BACON AND R. J. ROWE (*The Journal of the American Medical Association*, April 10, 1948) claim that the reduction in mortality following surgical procedures on the lower part of the bowel is due largely to advances made in the preparation and after-care of the patients rather than to refinements in surgical technique. The pre-operative preparation requires admission to hospital several days prior to operation, and during this time an effort is made to evaluate the patient as a "surgical risk" and so far as is possible to place him in a state of optimal nutritional, fluid, electrolyte, nitrogenous and vitamin balance, while the bowel is being prepared. Efforts are made to evaluate hepatic function, impairment of which necessitates the delaying of operation until an attempt has been made to remedy the condition. Anæmia and hypoproteinæmia are corrected when present. Adequate fluid intake is maintained and renal function is tested by checking the specific gravity. Preparation of the bowel with antibacterial agents and proper diet without purgation is important. If rectal irrigations are necessary, a solution containing six grammes of phthalylsulphathiazole or ten grammes of sodium bicarbonate is used. Phthalylsulphathiazole is given by mouth in doses of 0·1 gramme per kilogram of body weight per day. The post-operative management is as important as the pre-operative care in any operative procedure; the points of importance outlined by the authors include adequate care of nutrition particularly in relation to protein and vitamins. Extreme care is essential in the proper management of fluid and electrolyte balance, particularly for patients on intravenous therapy and for those whose pathological condition leads to abnormal loss by intestinal suction, fistulæ *et cetera*. Penicillin is given routinely during the post-operative period and sulphonamides if there has been contamination. Prophylactic measures and the use of anticoagulants are of importance in reducing incidence of and mortality from thrombo-embolism.

One-Stage Resection and Anastomosis of the Colon.

J. W. HINTON AND S. A. LOCALIO (*Annals of Surgery*, January, 1948) report a series of twenty-six consecutive colonic resections covering all regions of the colon above the peritoneal reflection. All resections were performed in one stage without a proximal colostomy or ileostomy and anastomosis was performed "aseptically" with the use of the Furniss clamp. The only death occurred suddenly on the fifth day from a pulmonary embolus. There were only three abdominal complications in the series, two obstructive and one infective. The prerequisites for success in this field of surgery are careful selection of patients and adequate pre-operative and post-operative treatment. The most important element in selection of patients is that only those without obstruction are suitable for this procedure. All patients received twelve grammes of succinyl-sulphathiazole per day. The authors describe and illustrate with diagrams their technique of anastomosis.

Tumours of the Carotid Body.

R. A. DONALD AND G. CRILE, JUNIOR (*The American Journal of Surgery*, March, 1948), present a report of five patients with carotid body tumours to emphasize the peculiar surgical features presented by these tumours and the manner in which they may be best handled. They state that tumours are closely adherent to the carotid vessels and structures and vary in size from three to fifteen centimetres. They are richly vascular and often pulsatile. Vertical as well as horizontal extension occurs and in many cases a mass presents on the pharyngeal or tonsillar region. Tumours are usually benign; malignant changes occur in 15% to 20% of cases. Metastases are usually confined to the regional lymph nodes and surrounding tissue; distant metastases are very rare. One such case is reported by the authors. The symptoms are usually those of a slowly growing non-tender mass in the superior anterior cervical triangle. The mass is mobile laterally, but not vertically. It may exhibit a bruit, thrill or expansile pulsation, depending upon the degree of vascularity. Other symptoms result from compression of local structures, such as the sympathetic, vagus and glosso-pharyngeal nerves. Carotid sinus syndrome occurs only in 3% of cases. The differential diagnosis includes branchial cysts, tuberculous glands, aneurysm, cystic hygroma, lymphoma, metastatic carcinoma, aberrant thyreoid and abscess. In treatment radiotherapy has been universally unsuccessful. The surgical difficulties are mainly those of inaccessibility and hæmorrhage. Ligation of the common carotid artery has a mortality of 24% to 65%. Complications occasioned by cerebral ischæmia have occurred in 7% of cases. If patience and care are used most carotid body tumours can be removed without damage of the carotid artery.

British Medical Association News.

SCIENTIFIC.

A MEETING of the New South Wales Branch of the British Medical Association was held on June 17, 1948, at the Royal North Shore Hospital of Sydney, Crow's Nest, New South Wales. The meeting took the form of a series of clinical demonstrations by members of the honorary medical staff of the hospital.

Congenital Heart Disease.

DR. STUART ALLEN presented three patients with congenital heart disease. The first, a girl, aged sixteen years, was stated to have a patent *ductus arteriosus* which was discovered by chance as she had always appeared to be normal. On examination a collapsing type of pulse and capillary pulsation were present. The systolic blood pressure was in the vicinity of 122 millimetres of mercury in both arms, but the diastolic pressure was 50 millimetres of mercury in the right arm and zero in the left arm. The cardiac apex beat was displaced slightly outwards, a continuous thrill with systolic accentuation was palpable over the upper part of the precordium, and the characteristic loud continuous murmur of patent *ductus arteriosus* was audible, being maximal in the second left intercostal space close to the sternal border with wide propagation. X-ray examination of the heart showed enlargement of the pulmonary conus with slight enlargement of the left ventricle.

The second patient, a girl, aged six years, had first attended the hospital in 1944 with a history of fits every few months. Her mother stated that she would "turn blue and stop breathing during the fit". At that time it was noted that she had a bright malar flush with no clubbing of the fingers and no cyanosis. The heart was enlarged, a systolic murmur was audible all over the precordium and the liver was palpable two and a half inches below the right costal margin. There was no peripheral œdema. Since then the child had been in hospital repeatedly with evidence of cardiac failure. She had failed to develop physically and her ability to stand exertion had gradually become more and more restricted, with correspondingly increased evidence of cardiac decompensation—dyspnœa, œdema of the lower limbs, and increased size of the liver. At the time of the meeting she had a pronounced malar flush, and a congested appearance of the hands and forearms and lower parts of the legs with a variable amount of œdema. There was no clubbing of the fingers or toes. The resting pulse rate was generally about 100 per minute, but the rhythm varied frequently—sometimes extrasystoles were present and fibrillation had been noted. The blood pressure was 110 millimetres of mercury (systolic) and 60 millimetres (diastolic). There was no bulging of the precordium and the apex beat was visible by a diffuse pulsation in the fifth and sixth intercostal spaces at the anterior axillary line where a thrill was palpable. A moderately harsh systolic murmur was audible generally over the precordium, being maximal medial to the apex beat, and at that area a diastolic murmur was also to be heard. The chest was clear of abnormal signs, but the liver was enlarged, reaching to the level of the umbilicus. X-ray examination of the heart showed much enlargement of both sides of the heart, while numerous electrocardiograms showed evidence of myocardial damage with abnormal *P* waves; at times ventricular extrasystoles had been noted and on one occasion auricular fibrillation. The diagnosis was congenital mitral stenosis.

Dr. Allen's third patient, a boy, aged six years, was suffering from Eisenmenger's complex. No history was obtainable except that the child had been short of breath on exertion recently. He had suffered from measles and repeated colds. On admission to hospital he was noted to be below average weight and height for his age, but mentally bright and alert. He was very cyanosed, the lips, cheeks, ears, fingers and toes being constantly blue, while he had well-developed clubbing of the fingers and toes and was dyspnœic on exertion, with discomfort on lying flat, and a loose cough. His pulse rate was 110 per minute with regular rhythm. The blood pressure was 80 millimetres of mercury (systolic) and 40 millimetres (diastolic) in both arms. The apex beat was diffuse, being found in the fifth intercostal space at the anterior axillary line. There was a palpable thrill over the base of the heart. A harsh systolic murmur was audible in the second left intercostal space half an inch to the left of the sternum, being conducted towards the lower end of the sternum. No peripheral œdema was present, but the lower border of the liver was palpable one inch below the right costal margin, and there were râles audible at both lung bases posteriorly. X-ray examination showed considerable enlargement of the heart, mainly ventricular, and generalized congestion of both lungs. The appearance was typical of congenital heart disease, possibly patent interventricular septum. The region of the pulmonary artery showed normal prominence. The electrocardiogram report was: "Abnormal *P* waves and abnormal *QRS* complexes. No preponderance of either ventricle." The blood contained 10,870,000 red blood cells per cubic millimetre and 27·6 grammes of hæmoglobin *per centum*.

Paroxysmal Hæmoglobinuria.

DR. I. BRODZIAK presented a male patient, aged sixty-four years, who had been first admitted to hospital in 1946 under the care of the urological unit for investigation of hæmaturia from which he had been suffering on and off for thirty years. It was noted after exposure to cold, but he stated that he was free from attacks in summer. He claimed that he passed almost pure blood and no clots. Sometimes the blood was bright red, sometimes dark. He gave a history of gonorrhœa several times about forty years before, and the development of Parkinsonism over the last thirty years. He was investigated by the urological unit and the results of panendoscopic examination, retrograde pyelography and indigo carmine tests were all negative. The results of Wassermann and complement-fixation tests were positive. Examination of dark red urine which he passed showed the presence of hæmoglobin. He was discharged from hospital with the diagnosis of syphilitic nephritis. He was admitted again on May 8, 1948, for investigation of his hæmoglobinuria. No change in his condition had occurred since the previous admission. Each attack left him weak and he also complained of increasing general fatigue. He stated that if he became cold and did not pass blood in his urine he suffered quite severe pain in the mid-abdominal region. There was no frequency or difficulty in micturition. On examination the patient had the typical expressionless face of Parkinsonism with tremor, rigidity and festinant gait. The pupils were equal and reacted only slightly to light, but not to accommodation. No other neurological sign was found. There was no clinical evidence of cardiac enlargement; a harsh apical systolic murmur was present. No abnormality was found in the alimentary system. Examination of the blood revealed a simple secondary anæmia. The results of Wassermann and complement-fixation tests were again positive. Cultures of *Staphylococcus albus* and *Bacillus coli* were grown from the urine. Cold agglutinins were present in a titre of only 1:8. The Donath-Landsteiner reaction was present. The serum protein content was 7·0 milligrammes *per centum*.

Infantile Scurvy.

DR. F. LAWES presented a male infant, aged nine months, who had been admitted to hospital on February 11, 1948. The history given by the relatives was that the child had been noticed to be pale for three days and cried when his legs were moved or when he was picked up. Two days before bringing him to hospital they had noticed a swelling of the right knee and a sore both on the penis and behind the right ear. No bleeding had been noticed anywhere. The mother had not attended the baby clinic. The child had been fed on milk and water sweetened with sugar and had had no emulsion at any time and no orange juice for three months. The almoner's report disclosed grossly unsatisfactory home conditions. On examination the baby was deathly pale. There was a small sore behind the right ear as well as one on the penis. Great swelling of the right thigh and right wrist was present. The pulse was rapid. The tonsils were enlarged and there was thrush on the tongue. Two lower teeth had a dark red and black line around the base; no bleeding was present, but the gums were very swollen around these teeth. X-ray examination revealed an "appearance of typical scurvy, large subperiosteal hæmorrhages involving practically the whole of the shafts of femur and tibia". A blood count revealed the presence of hypochromic microcytic anæmia of severe degree. The patient was given a transfusion of 300 millilitres of blood and the daily administration commenced of ascorbic acid 100 milligrammes, vitamin *B* nine milligrammes and vitamin *K* four milligrammes. He made a rapid response to treatment and was restored to general health in a few weeks. The limbs had been treated by the honorary orthopædic surgeon and the child was on an abduction frame for two months. At the time of the meeting he was no longer on the frame and had full movement at all his joints. Dr. Lawes said that there might be some residual deformity, but its full extent would not be known until the child was walking.

Tuberculous Empyema Treated with "Promanide" Solution.

DR. DOUGLAS ANDERSON presented a girl, aged sixteen years, who had been found to have tuberculosis of the upper lobe of the right lung in February, 1947. The disease was then evidently recently installed and of a florid type with cavitation. However, she made very favourable progress under treatment, which included artificial pneumothorax. In November, 1947, by which time she was active, symptomless and outwardly very well, she developed a pyothorax on the affected side "out of the blue", and soon became very ill again. Pneumococci were recovered from the pus at the country hospital to which she was first admitted. Dr. Anderson remarked that when cocci were found in pus from an artificial pneumothorax, it was safe for the physician to assume that he was dealing with a mixed tuberculous empyema, even though no tubercle bacilli might be found. The case under discussion was one in point, for tubercle bacilli were later found in the pus, after the cocci had been eradicated with instillations of penicillin. On the patient's arrival at the Royal North Shore Hospital the pus was aspirated from the chest and the pleural cavity was irrigated with several syringefuls of normal saline solution. That treatment was repeated every two or three days. Her general health improved a good deal, but pus reformed unusually quickly. On January 3, 1948, 2·5 millilitres of "Promanide" solution (containing 0·4 gramme per millilitre of the active principle) were injected into the pleural cavity after the aspiration of the pus. On January 5 it was found that the pus, which had thereunto been uniform in consistency, was much thinner. Further injections of "Promanide" solution were made with each aspiration. On January 13 the liquid aspirated from the pleural cavity was almost clear and there were only a few millilitres of it. No tubercle bacilli could be found in this fluid and none grew on culture. Still her fever had not abated. It was presumed that that was due to active tuberculous disease in the right lung or pleura, although none could be recognized in the X-ray films, and it was decided to administer streptomycin in the hope that it would curb the activity of the tubercle bacilli and permit of the rallying of her natural defences against them. In a fortnight's time, whether because of that treatment or otherwise, her pyrexia had quite resolved, and did not recur when the streptomycin was suspended. Her health had since improved rapidly. She was again symptomless and outwardly well, though her lung, which was only half-expanded, was probably not expansible further, and though she carried a large collection of clear fluid in her chest.

Tuberculous Meningitis Treated with Streptomycin.

Dr. Anderson's second patient was a boy, aged fifteen years, who on March 20, 1948, had come home from school with an illness that was at first taken to be some sort of influenza. On April 2 rigidity of the neck and apathy were noticed. A lumbar puncture was made and an examination of the cerebro-spinal fluid by Dr. Marjory Little showed it to contain numerous lymphocytes; the sugar and chloride levels were much depleted. A diagnosis of tuberculous meningitis was made and treatment with streptomycin was begun at once without waiting for bacteriological confirmation of the diagnosis, which was forthcoming after twenty-six days' incubation of cultures made from the fluid. It was feared that the source of the boy's meningitis was an old tuberculoma within the cranium, because he was known to have reacted to an intracutaneous tuberculin test at the age of three years and because no evidence could be found of tuberculous disease elsewhere. Dr. Anderson said that if that was so, and there was a reservoir of tubercle bacilli communicating with the subarachnoid space, the outlook for him was very much worse than it would be if he was suffering from recently installed intracranial tuberculous disease. The streptomycin was administered in fairly large doses—0·2 gramme every other day intrathecally, and (in the hope that some of it might reach a leaking intracerebral lesion) 2·0 grammes daily intramuscularly. Within a few days of the beginning of the treatment the boy became normally bright in his mental state and had remained so; but after twenty-eight days of the treatment the intrathecal medication had obviously produced a subacute hæmorrhagic leptomeningitis, while the systemic medication had produced pyrexia and so much loss of weight (attributed to the pyrexia) that it was feared that the treatment might reduce any natural powers of resistance to the disease that he might possess. Furthermore, the effect of the treatment on the cerebro-spinal fluid, though it was promising at first, was disappointing—the number of lymphocytes present fell rapidly in the first fortnight, but never to within normal limits, and after about three and a half weeks began to rise again; the sugar level likewise rose in the first fortnight, but never to the normal value, and after about three and a half weeks began to fall again. Accordingly intrathecal treatment was temporarily suspended and the intramuscular dosage of the streptomycin was halved. At that stage Dr. Beatrix Durie had kindly undertaken several bacteriological assays of the streptomycin content of the cerebro-spinal fluid at different intervals after the introduction of the drug. She found that after two days the content was about seven microgrammes per 100 millilitres and that after seven days the content was about four microgrammes per 100 millilitres. Dr. Anderson said that, since it was said that six or seven microgrammes per 100 millilitres was an effective concentration, those results seemed to indicate that a less frequent intrathecal administration of the drug, which would have been presumably less irritating, might have had a sufficient antibacterial effect. At the time of the meeting 0·2 gramme of streptomycin was administered intrathecally every three days. The boy was brisk and bright and his weight was increasing. Meningeal irritation was not in evidence. Examination of the cerebro-spinal fluid showed that the tuberculous infection was reduced but not arrested.

Hereditary Hæmorrhagic Telangiectasia.

DR. HALES WILSON presented a male patient, aged sixty-two years, suffering from hereditary hæmorrhagic telangiectasia. Dr. Wilson said that the condition was an hereditary vascular anomaly leading usually to hæmorrhage. The sexes were equally affected and transmitted the condition as a simple dominant. Multiple dilatations of capillaries and venules were found in the skin and mucous membranes, especially on the face, ears, lips and tongue, in the nose and occasionally in the trachea or stomach. They varied in size from less than a millimetre to nearly a centimetre in diameter and were sometimes nodular. The colour was bright red or purple. Anæmia due to blood loss was common, but apart from that the blood was normal. In the presence of multiple telangiectases, recurrent localized bleeding and the family history, diagnosis was easy. Treatment consisted in control of bleeding, which was usually nasal, by electrocoagulation, iron therapy and blood transfusion; rutin was on trial. The patient presented had suffered from frequent epistaxis for sixteen years. His father also had been prone to nose bleeding and so was his son. Transfusion of blood had been given.

Fracture of Base of the Skull.

DR. H. HUNTER JAMIESON presented a girl, aged seventeen years, who had been admitted to hospital after having been involved in a motor-cycle accident as a "pillion passenger". Her depth of unconsciousness was such that there was no response to tactile, vocal or painful stimuli. There was bleeding from the nose, mouth and left ear. Examination of the nervous system showed absent abdominal reflexes, exaggerated knee and ankle jerks, with a Babinski reflex on both sides. The pupils were small and roving, but reacted slightly to light. She was treated with paraldehyde, penicillin and magnesium sulphate (50% solution) given rectally. On the next day the depth of unconsciousness was increased. The pupils were contracted, equal and roving, and reacted to light. The breathing was stertorous and automatic. Despite a very rapid pulse rate the blood pressure was well maintained. The condition of the patient was graver. Three days later the depth of unconsciousness had diminished, while the pulse rate was slower and the tension approaching normality. The pupils were more dilated. The patient was very restless and moved about continuously in bed. On the following day the first evidence of respiratory depression was seen and respirations became so depressed that the patient was temporarily placed in a respirator. Three days later the temperature rose to 105° F. The chest on X-ray examination was found to be normal. A disturbance in the "heat centre" was suspected. From that time the patient slowly improved. Because of that, operative interference was thought inadvisable. Partial regaining of consciousness was first noted thirty-one days after admission and that gradually proceeded to full regaining of consciousness in the next forty-eight hours. On discharge from hospital, the patient was fully orientated and symptom free. The memory for recent events was good. X-ray examination of the skull had revealed no fracture in the cranial vault; a fracture through the base of the right condylar process of the mandible was in good position.

Perforation of the Rectum.

Dr. Jamieson then presented a man, aged twenty-four years, who had fallen and impaled himself upon a large stake. The findings at operation were an irregular tear in the anterior wall of the rectum just behind the bladder and bruising around the anus and along the anal canal.

The operative procedure consisted of opening the abdomen through a lower mid-line incision, suturing the rectal tears in layers and making a left inguinal colostomy. The administration of penicillin and phthalylsulphathiazole and intravenous saline therapy were commenced before operation and continued afterwards. Gas-gangrene antiserum was also given. Convalescence was uneventful; the colostomy was closed just less than four weeks after operation. Eighteen days later, when the patient was discharged from hospital, the wound over the former colostomy site had completely healed, the bowels were functioning normally and the patient was feeling very well.

Obstructive Jaundice after Cholecystectomy.

Dr. Jamieson's next patient, a man, aged seventy years, had been admitted to hospital with a diagnosis of obstructive jaundice due to a stone in the common bile duct eighteen months after having undergone cholecystectomy. At operation the common duct was opened and explored; pus and bile escaped under tension, and much biliary "mud" and gravel was evacuated. The head of the pancreas was indurated. Intravenous therapy was necessary before and after operation with blood, serum, saline solution and "Parenamine". The patient's cardiac condition was poor before operation, and shortly after operation peripheral circulatory failure associated with salt depletion began to develop, but the condition improved considerably after the rapid infusion of five litres of saline solution in twenty-four hours. Convalescence was slow but uneventful; the jaundice gradually disappeared and on the patient's discharge from hospital recovery was complete.

Recovery from Paraplegia due to Secondary Carcinoma of the Spine.

Dr. Jamieson's last patient, a woman, aged fifty years, had been operated on for carcinoma of the breast in March, 1940. She was quite well for four years, but then began to have pain under both shoulder blades, and by August, 1944, was in severe pain. She then began to lose the use of her legs, and by the end of 1944 was completely paralysed from the waist down and was bedridden. By February, 1945, her bowels and bladder were paralysed; her bladder became badly infected and washouts were necessary. She came under Dr. Jamieson's care in April, 1945. In May, 1945, a first course of deep X-ray treatment was given at Prince Henry Hospital. Massage and reeducation of the lower limb muscles were started, and immediately after that there were signs of improvement in the left leg and foot. There was no improvement in the right foot and leg for some time. In May, 1946, a second course of deep X-ray treatment was given by Dr. Harold Ham. By July, 1946, both leg and thigh muscles had almost fully recovered, and the patient was allowed up in a spinal brace. In October, 1947, a third course of deep X-ray treatment was given at the Royal Prince Alfred Hospital, and during that month she was given a lighter spinal brace. There was complete recovery by the early months of 1948.

(To be continued.)

A MEETING of the New South Wales Branch of the British Medical Association was held at the Royal Hospital for Women, Paddington, on July 22, 1948. The meeting took the form of a series of clinical demonstrations and lectures by members of the honorary medical staff of the hospital.

Hormonal Disturbances in the Pregnant Diabetic.

DR. KEMPSON MADDOX, in a discussion on hormonal disturbances in the pregnant diabetic, said that the hormonal disturbances in normal pregnancy were well known to the audience. The pituitary gland as ever was the control box. It enlarged in size, doubled its weight, and underwent major histological changes. The chief or pregnancy cells appeared and basophile cells diminished. Follicle-stimulating hormone fanned the growth of the ovum, œstrogen was formed in the follicular fluid, the ovum ruptured, and the *corpus luteum* formed progesterone, again stimulated by the pituitary. With the establishment of the decidua, the placenta took over, and œstrogen and progesterone began to appear in large quantities from that source. From the third month those hormones increased steadily in inverse proportion to chorionic gonadotropin. Progestin protected œstrogen from too rapid degradation to œstradiol and œstrene, but itself was degraded to and excreted as pregnandiol. Together those two hormones limited the production of chorionic gonadotropin, and when they finally failed, just before term, chorionic gonadotropin increased rapidly in the serum, the inhibited pituitary gonadotropin was unfettered and uterine sensitivity was enhanced until labour occurred.

Dr. Maddox pointed out that damage by infarction, hæmorrhagé or premature aging of the placenta might well interfere with the production and sensitive balance of the hormones, so that habitual abortion, uterine irritability, intrauterine death *et cetera* were probably closely related to such disturbances. He believed that an endocrine laboratory should form an integral unit in the laboratories of every obstetric institution. The possible role of gonadotropic abnormalities in the genesis of pregnancy toxæmia had received much attention. The results of such studies had often been conflicting, but the small numbers of patients in the series presented, the errors, delays, and approximations of bio-assays, and the renal factor in excretion, must be taken into consideration. With the advent of chemical methods, vaginal smear controls *et cetera* more exactitude would be possible. The role of the antidiuretic hormone of the pituitary and pituitary-adrenal relationships in regard to pressor and salt-retaining mechanisms would no doubt soon be stated with more exactitude. Much of the evidence as it stood currently was suggestive only, but it was slowly piling up in favour of the idea that primary progesterone failure exposed œstrogens to destruction and the organism to excess gonadotropins in pregnancy toxæmia. Artificial correction of that imbalance, if made in time, seemed to arrest the usual evolution of preeclampsia.

Turning to the question of diabetics, Dr. Maddox said that they suffered from a hormonal imbalance whereby the islets of Langerhans were exhausted by hormones from the pituitary and perhaps the adrenal cortex, as yet unidentified. Amenorrhœa or menstrual irregularity was common in untreated diabetics, and uncontrolled diabetes did prevent ovulation and pregnancy. Since the introduction of insulin, diabetic women were almost as fertile as their non-diabetic sisters. The longer the diabetes had existed, however, the older the gynæcological age of the women. In addition to hormonal failure, the vascular factor might be of importance, and tissues supplied by the branches of the uterine arteries might suffer from true ischæmia, both before and during pregnancy. No woman with a twenty-five-year history of diabetes had produced a living child. The gynæcological age of a diabetic woman who had been diabetic for ten years or more was an equivalent number of years greater than her chronological age. She was therefore more in danger of pregnancy toxæmia. If the diabetes remained uncontrolled during gestation, electrolytic and osmotic disturbances were superadded. There was no increase in the incidence of diabetic coma, however, and maternal mortality was almost nil. The endocrines were very specific, and it was unlikely that the disturbance in carbohydrate metabolism was directly responsible for the endocrine failure and toxæmia so dangerous to the fœtus late in a diabetic pregnancy. The overlap, if any, was probably in the pituitary hormone assembly. Thus the lowered leak-point of urinary sugar in the pregnant diabetic had never been explained, but was probably by a hormonal mechanism in which the fourth ventricle-hypothalamic-pituitary relationship was active, rather than an alimentary hyperglycæmia as Jansen and Hurwitz suggested. Dr. Maddox said that he had recently seen a woman who was early in the diabetic state during her pregnancies, another who had become progressively more acromegalic with each pregnancy, another who developed her *diabetes insipidus* first during pregnancy and others with pan-pituitary failure dating from pregnancy. Vitamin insufficiency might predispose to abnormal endocrine relationships, or to liver dysfunction, and so to failure to destroy the steroid hormones at a normal rate. The question was too conjectural and involved to pursue further at the meeting, but whatever theories eventually prevailed, it appeared that in diabetic pregnancies, recognition and artificial correction of simple hormonal imbalance were worthy of attention. Dr. Priscilla White, of Boston, had been a pioneer in such therapy in pregnant diabetics. Her colleagues, the Smiths, had shown that in many women who subsequently developed toxæmia, a deficiency of œstrogen and progestin corresponded to a rise in the amount of chorionic gonadotropin, recognizable in increasing degree from the sixteenth to the twentieth week onward. It was found that fœtal mortality was high when such an imbalance existed in the pregnant diabetic, and was allowed to remain uncorrected. Smith, Smith and Hurwitz had recently concluded that lowering of the amount of œstrogen and progestin was a more reliable warning than the rise in amount of prolan. The fœtal mortality mentioned, which consolidated statistics placed at an average of 40%, was, of course, not all due to pregnancy toxæmia, but also to sudden unexplained death *in utero*, obstetric difficulties in delivery of large babies, uterine inertia, congenital defects,

neonatal atelectasis, probably associated with overbreathing of the amniotic fluid, and rarely hypoglycæmia. Some of the causes were irremediable, but White had shown that hormonal correction, where indicated, and special obstetric and neonatal procedures, had, in her hands at least, reduced fœtal mortality to 6%. Dr. Maddox quoted Dr. Priscilla White's figures in some detail.

Outlining the management of the diabetic during pregnancy, Dr. Maddox said that the hormonal status was investigated weekly from the twentieth week onwards by determination of urinary pregnandiol content and of serum gonadotropin content, and by staining of vaginal smears by the Papanicolaou technique for œstrogen effects. An effort was made by the daily parenteral injection of synthetic progestin and œstrogen to keep the serum gonadotropin level below 200 rat units per 100 millilitres of blood, and to keep acidophilic cells in the stained smear at a minimum and pre-cornified cells in abundance. Towards term, doses of the artificial hormones required often amounted to 30 to 35 milligrammes *per diem*. They did not appear to do obstetric harm, although lochia might remain red for a few days longer than usual. It was too early to say whether any carcinogenic influence might ultimately be apparent, but so far there had been no suspicion of such a sequel. The treatment was expensive, owing to the cost of commercial progestin, and troublesome, but the dramatic drop in the chances of neonatal death was the preponderant consideration. They were hopeful, in a combined inquiry by the Royal Hospital for Women and another obstetric institution, of investigating the results of œstrogen replacement alone, perhaps combined with implanted progestin.

Dr. Maddox said that White's results had been so spectacular that they had naturally been questioned, and had been ascribed to the special diabetic care and instruction which patients received at her clinic *et cetera*, but reports of similar success elsewhere were increasing. White herself did not deny the essentiality of rigid control of the diabetic state by the aid of frequent chemical examination of the blood and close attention to all nutritional requirements, combined with full cooperation on the part of the patient, an axiom for success in all diabetic problems. It was equally necessary for the obstetrician and physician to have a complete understanding of procedure and of each other's viewpoint.

Medical Practice.

THE following letter from the Victorian Department of Health is published at the request of the Medical Secretary of the Victorian Branch of the British Medical Association.

[COPY.]

DEPARTMENT OF HEALTH, GENERAL HEALTH BRANCH.
295 Queen Street,
Melbourne, C.1,
1st October, 1948.

Dr. Dickson,
Secretary,
British Medical Association,
Albert Street,
East Melbourne, C.2.

Dear Dr. Dickson,

The recent investigations by this Department into the potency of Liq. Ext. Ergot, about which Dr. Hudson has been in communication with you, resulted in the following conclusions.

The preparations supplied by the wholesalers were all grossly deficient in active principles, and the current pharmacopœia preparation was practically unobtainable, there being only a few ounces available from one wholesaler.

Discussion with medical men including authorities in this connection indicated that very few practitioners would be aware of the distinctions between the 1914 and 1932 preparations.

These facts suggest that substitution is regularly occurring when Ext. Ergotæ Liq. is prescribed.

The pharmaceutical body concerned is being informed of the obligation to supply the current pharmacopœia preparation unless otherwise specified, but as the practice has apparently gone on for some years it may be desirable in the interests of patients for practitioners to specify the current pharmacopœia when prescribing, and so assist in changing this long continued custom.

It may be pointed out that although the 1932 preparation is somewhat unstable, its potency on preparation is greater than that of the very doubtful 1914 preparation and further has a standard set by the B.P., thus giving this Department control over its potency. This is not the case with the 1914 preparation.

Yours faithfully,
(Signed) J. WHITLOCK,
Secretary, General Health Branch.

Correspondence.

ACUTE HÆMATOGENOUS OSTEOMYELITIS.

SIR: In the reports of the Australasian Medical Congress under the Section of Pædiatrics, "Acute Hæmatogenous Osteomyelitis" (October, 1948), there is an error in the report of my remarks on page 441 where it is stated: "It had been noted that the efficacy of penicillin was seriously impaired if the hæmoglobin value fell below 90%." The figure should be 80%. If the hæmoglobin was below 80% blood transfusion was the routine procedure.

Yours, etc.,
McKELLAR HALL.

224, St. George's Terrace,
Perth,
November 10, 1948.

AN APPEAL.

SIR: With the approach of the Christmas season, may I use your journal as a medium of drawing the attention of members of the profession to the recent appeal for funds by the Medical Benevolent Association of New South Wales?

These moneys will provide some measure of Christmas comfort and cheer to our less fortunate colleagues and their dependants.

Further, may I ask for confidential information of any who may be in need of the assistance we are eager to give?

Yours, etc.,
R. J. WHITEMAN,
President, the Medical Benevolent Association of New South Wales.

135, Macquarie Street,
Sydney,
November 12, 1948.

THE RISK OF THE HERXHEIMER REACTION.

SIR: On the basis of the last few years' experience, there is little doubt now that penicillin is almost as effective against late syphilis as against the early one. Moore even believes that "in its immediate effect, at least, the drug appears to be more effective in neurosyphilis than in early syphilis".(1) Destroyed tissues cannot be restored, of course, nor can scars be softened. But otherwise it has been proved that penicillin affects the active late syphilitic manifestations of the liver, the central nervous system, the cardio-vascular system, and furthermore that the effect is mostly a rather rapid one. Under such circumstances one has to take into consideration the risk of the Herxheimer reaction. The uneasiness about it might be the reason why a surprisingly low initial dosage has been advocated by some authors against these diseases. A starting dosage of 10,000 to 5000 unit injections, or even less, is recommended and caution urged in increasing the dosage.(2) Though other authors, experts also in this modern field, feel that the treatment of late syphilitic disease of the cardio-vascular system by penicillin can be regarded as safe whatever dosage is used, I would not leave it unmentioned that in the literature there are already many hints of serious Herxheimer reactions observed in such cases.(3) There are Christian's words in his chapter on cardio-vascular syphilis:(4) "Penicillin has been reported to have caused severe reactions in some of these patients." In the recent book "Penicillin in Neurology",(5) the authors estimate the occurrence of Herxheimer reactions in the treatment of neurosyphilis with penicillin as high as 10%. At one of the Sydney Hospital meetings, to which to be admitted I feel highly honoured, the suspicion of a Herxheimer reaction in case of a syphilitic disease of the spinal cord treated with penicillin has been discussed. On this occasion, Dr. Palmer remarked that at the post-mortem investigation of a case of penicillin-treated cardio-vascular syphilis with a sudden fatal outcome, he had to

take the possibility of a Herxheimer reaction into consideration.

All this makes me wonder whether it would not be advisable to initiate a penicillin treatment in every case of late syphilis. I do not wish on this occasion to deal with the merits of the therapeutic side of penicillin treatment, especially not for cases devoid of any manifest symptoms where treatment with penicillin might be regarded as superfluous, at least in principle: *"Quieta non movere."* But I would trend towards a somewhat prophylactic treatment to give security to the patient as well as to his physician—the security that in eventual later penicillin treatment against other infections (pneumonia, erysipelas, any suppuration *et cetera*) with the usual big doses there should be no need to reckon with the risk of a Herxheimer reaction which may develop quickly and even if slight might inflict serious harm to the acutely outbalanced patient. Would the slowly acting peroral intake of penicillin not be suitable for this purpose? It would not interfere with the occupation of the patient. It undoubtedly produces and maintains an effective blood level and is becoming more and more used in the United States.[6]

But I hesitate a little. Would this "prophylactic" treatment not do more harm than good? Is the supposed danger of the Herxheimer reaction not so remote that we need not care about it? Is this "prophylactic" treatment not *ab ovo* prohibitory on account of high cost? I confess that I do not feel happy about this question in which I am keenly interested. Therefore I would be much obliged, and at the same time I believe it may do some good to our patients, if colleagues with experience in this field would make comments on this matter.

Yours, etc.,

CHARLES ENGEL.

201, Macquarie Street,
Sydney,
November 17, 1948.

References.

(1) J. E. Moore: "Penicillin in Syphilis", *Transactions of the Association of American Physicians*, Volume LX, 1947, page 172.
(2) Veterans' Administration: "The Management of Syphilis", *The Journal of the American Medical Association*, Volume CXXXIV, 1947, page 1537.
(3) R. E. Dolkart and G. X. Schwemlein: "The Treatment of Cardiovascular Syphilis with Penicillin", *The Journal of the American Medical Association*, Volume CXXIX, 1945, page 515.
(4) H. A. Christian: "The Principles and Practice of Medicine", 1946, page 464.
(5) H. E. Walker and H. C. Johnson: "Penicillin in Neurology", page 157.
(6) W. C. Cutting, R. M. Halpern, E. H. Sultan, C. D. Armstrong and C. L. Collins: "Administration of Penicillin by Mouth", Volume CXXIX, 1945, page 425.

Nominations and Elections.

THE undermentioned has applied for election as a member of the New South Wales Branch of the British Medical Association:

Hall, Peter Francis, M.B., B.S., 1947 (Univ. Sydney), 265, Edgecliff Road, Edgecliff.

Notice.

AN OMISSION FROM THE MELBOURNE TELEPHONE DIRECTORY.

THE Medical Secretary of the Victorian Branch of the British Medical Association wishes to point out that the telephone number and address—JM 1292 and 85, Spring Street—of Dr. Douglas R. Leslie have been omitted from the "pink pages" of the November, 1948, issue of the Melbourne Telephone Directory.

A MARRIAGE GUIDANCE COUNCIL.

DR. J. A. SMEAL, of Canterbury, Victoria, wishes to announce that a movement is on foot to inaugurate a marriage guidance council unassociated with any religious or political association. A meeting will be held at Toc H House, 476, Collins Street, Melbourne, on November 30, 1948, at 8 o'clock p.m., and it is hoped that at this meeting a constitution will be adopted and an educational programme launched. Tentative plans are being made to help early inquiries about matrimonial conciliation and it is also hoped to enlist the aid of psychiatrists, physicians, gynæcologists and other medical practitioners when mental and physical abnormalities lie at the root of marital disharmony. Medical practitioners are invited to attend the meeting.

Diary for the Month.

Nov. 29.—Victorian Branch, B.M.A.: Executive Meeting.
Dec. 1.—Victorian Branch, B.M.A.: Annual Meeting.
Dec. 1.—Victorian Branch, B.M.A.: Council Meeting.
Dec. 1.—Western Australian Branch, B.M.A.: Council Meeting.
Dec. 2.—New South Wales Branch, B.M.A.: Special Groups Committee, Clinical Meeting.
Dec. 2.—South Australian Branch, B.M.A.: Council Meeting.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Honorary Secretary, 135, Macquarie Street, Sydney): Australian Natives' Association; Ashfield and District United Friendly Societies' Dispensary; Balmain United Friendly Societies' Dispensary; Leichhardt and Petersham United Friendly Societies' Dispensary; Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney; North Sydney Friendly Societies' Dispensary Limited; People's Prudential Assurance Company Limited; Phœnix Mutual Provident Society.

Victorian Branch (Honorary Secretary, Medical Society Hall, East Melbourne): Associated Medical Services Limited; all Institutes or Medical Dispensaries; Australian Prudential Association, Proprietary, Limited; Federated Mutual Medical Benefit Society; Mutual National Provident Club; National Provident Association; Hospital or other appointments outside Victoria.

Queensland Branch (Honorary Secretary, B.M.A. House, 225, Wickham Terrace, Brisbane, B.17): Brisbane Associated Friendly Societies' Medical Institute; Bundaberg Medical Institute; Brisbane City Council (Medical Officer of Health). Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL or position outside Australia are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.

South Australian Branch (Honorary Secretary, 178, North Terrace, Adelaide): All Lodge appointments in South Australia; all Contract Practice appointments in South Australia.

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